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January 15, 1989

Natural Resources Management Support Project
(AID Project No. 698-0467)

Contract No. AFR-0467-C-00-8054-00

NRMS

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USAID/MALI ACTION PROGRAM

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EXECUTIVE SUMMARY

Background and Approach

The Mali Action Program presented in this report is a product of the Natural Resources Management Support Project (698-0467). The Action Program is intended to help USAID/Mali, GRM and other donors explore ways that they can refocus projects or develop new ones to support more environmentally sustainable development. The impetus for the Action Program comes from the Africa Bureau's Plan for Natural Resources Management (PNRM) which has the overall objective of promoting actions which will lead to improved soil and water conservation, soil fertility, vegetative cover and biological diversity in major agroecological zones.

The Action Program builds on an earlier substantial assessment of natural resources management projects and activities during the Sahel Sub-Regional Natural Resources Assessment (SSRA) in 1987. The SSRA identified promising initiatives in natural resources management and the conditions under which they worked. The starting point for the Mali Action Program was the question: what is required to achieve sustainable agricultural development within a twenty-year time frame over a significant area in a given country? The response to this question begins with the working hypothesis that there is sufficient empirical experience to develop strategies in local resource management that can help refocus existing projects on the integration of natural resources and agricultural production activities or develop new projects or programs. It is a working document that should be used to inform both policy and programming discussions, rather than being seen as a definitive plan for natural resources management in Mali.

Linkage to the GRM National Anti-Desertification Plan

The Action Program uses the guidelines developed in the SSRA to identify the programs of the GRM's National Anti-Desertification Plan (Plan National de Lutte Contre la Desertification - PNLCD) which are linked to PNRM priority objectives. The PNLCD programs most directly supporting PNRM objectives are those for:

- The design and execution of land use management approaches using "test zones" in six major agroecological zones of Mali (PNLCD Program I);
- Training, public information and extension in conservation land management (PNLCD Program IV);
- Creation of a National Research Center (or program) on desertification (PNLCD Program V);
- Reorientation and integration of land use management actions in the activities of the regional rural development organizations; and (PNLCD Program VI),
- Supporting measures of legislation and public administration (PNLCD Program VIII).

The Action Program recommends support to the PNLCD through the use of sustained investment in local natural resources management strategies (LMS's) and supporting measures in applied research, policy dialogue and environmental monitoring. A geographical concentration on the semi-arid and sub-humid zones is recommended, because local resource management strategies have the best chance to succeed in these areas.

Local Resource Management Strategies (LMS's)

The local resource management strategies (LMS's) are approaches to sustainable development built of promising initiatives collected during the SSRA and from other experience (See Chapter 3). They address Programs I, IV, VI and VIII of the PNLCD. The technical, organizational and financial elements of these initiatives have been combined with measures of extension, training and technical assistance to spread their use over time to a significant portion of the population in the semi-arid and sub-humid agroecological zones of Mali. The LMS's contain technologies which have already demonstrated under Sahelian conditions the capacity to improve sustained yields of food, forage, wood and other products. They are implemented starting with a select group of contact farmers to verify technologies and adjust incentives and other implementation conditions before broader deployment is done. Economic incentives are provided to farmers on the condition that they follow a management plan and share custodial responsibility with the GRM for the husbandry of soils and vegetation. Additional incentives to adherence to the plan are provided through local modification of land and resource tenure and access codes. To ensure that the strategy is employed on a broad enough scale to affect most of the land within a village's control, local organizations are strengthened to serve as intermediaries in the supply of credit, inputs, marketing and outreach services. Farmers failing to follow the plan lose the benefits.

Each of the strategic elements, and combinations of many of them, had to have been observed in the field before they were incorporated into a LMS. For the purposes of cost:benefit analysis, total costs of the strategies have been used to evaluate the financial viability of each strategy (these spreadsheets are available at USAID/Mali). In some areas of Mali, however, Local Management Strategies can be incorporated into existing programs (Operation Haute Vallee, for example) without substantial new investment. In other cases, the LMS can be used to help structure the implementation of new projects (e.g., World Bank support to the Vth Region's "test zone" of the PNLCD). In other areas, a local development agency, such as an ONG, can use the LMS as a framework to plan and structure its interaction with farmer groups and national programs in a way which integrates both short-term production and longer-term resource conservation objectives. The financial costs of natural resources activities can be reduced by grafting them onto on-going programs and projects.

Four local management resource strategies (LMS's) are presented (Chapter 4) which followed SSRA guidelines for sustainable development. The four strategies are the:

o Sub-Humid Zone LMS - An approach targeting 500,000 hectares over 20 years. The strategy is implemented by local farmer groups which receive loans, training and extension services for near-term investment in improvement of soil fertility and rainfall retention, medium-term investment in composting and hedge-rows and longer-term investment in natural and village forest management. A combination of forest products, grain hedging and cash crops provides the economic engine for the strategy and financial incentives for farmer adherence to the land management plan. Average annual cost to the farmer would be about $75 per hectare. Total cost to the GRM and donors is $61 million. Loan funds of $44 million are needed as well.

o Semi-Arid Zone LMS - An approach targeting 500,000 hectares over 20 years. Farmer groups receive loans, training and extension services for near-term investment in improved use of rock phosphate, medium-investment in field trees, windbreaks and improved use of manure and longer-term investment in woodlot management. Cereal banks and returns from forage and tree product sales provide the financial basis for the strategy. Average annual cost to the farmer would be about $103 per hectare. Total cost to the GRM and donors is about $80 million. In addition, $54 million in loan funds must be provided.

o Bottomland LMS - An approach of potential application to 2 percent of the land area of Mali targeting 500,000 hectares over 20 years. Farmer groups adhere to a land management plan that provides for an intensively-managed tree upperstory with short-term understory crop production a secondary focus. Poles, firewood, forage and crops provide the financial returns to farmers and to the farmer groups which sanction the management plan. Average annual cost to the farmer is about $159. Total cost to the GRM and donors is about $3 million with an additional $334 million in loan funds.

o Woodlands LMS - An approach which targets 500,000 hectares of the estimated 35.5 million hectares of forest land in Mali. Farmer groups would adhere to management plans to conserve soil and water, enhance tree composition and improve forage availability. Poles, firewood, forage and other forest products are sold for the financial gain for farmers and their groups. Average annual cost per hectare is about $40. Total cost to the GRM and donors is about $1 million with an additional $2 million in loan funds.

The four Local Management Strategies are presented here as approaches which require additional examination and refinement by development agencies. The LMS's are meant to be manipulated and adjusted to fit local circumstances. They are not plans or blueprints to be blindly followed. Some elements may not be needed or fit in a given setting.

Research Conclusions and Recommendations

The GRM is being assisted by the World Bank, USAID and ISNAR to develop a long-term research strategy. The outcome of this work will have important institutional implications, including the feasibility of the National Desertification Research Center proposed as Program V of the PNLCD. The Action Program team agrees that there is a vital need to consolidate the research information base on desertification and to use it to

guide research programming. The decision about whether a new institute or a restructured set of programs best addresses this need should not be made without the results of the long-term research strategy study.

In the interim, applied research opportunities include:

o as the top priority, establishment of a baseline for monitoring of changes in forest cover and condition at five-year intervals, using existing PIRT materials as the starting point;

o applied in-field research to adapt and refine techniques of soil fertility management, soil and water conservation and improvement of natural vegetation management to the different natural and socioeconomic conditions of the test zones or other areas of concentrated development activity;

o field studies to identify natural resources management interventions in the riparian and pastoral environments excluded from the SSRA.

Natural Resources Policy

The GRM and donors should follow a two-tier strategy in improving natural resources management policy. One tier is the modification or local negotiation of resource access and use codes to support development programs. The second tier is policy dialogue to modify national codes for forests, pastoral lands and rural lands in general. Policy modification is underway at both levels through existing development projects and through national studies and drafts of new codes, but additional evidence that local management can both enhance resource use and protect the environment against further degradation is needed before major changes can be made in the policies and in the institutions which implement the policies.

Donors should not wait for statutory change to start programs. The experiences described in the SSRA show that field actions and ad hoc tenure modifications lead to statutory change over time. Sustained field initiatives of the type outlined in the LMS's are the major way that consensus can be formed about the benefits of locally-defined use rights linked to local resource management plans. Land tenure, tree tenure, tree product harvesting, forage access and fire management are key areas of policy which need to be incorporated in negotiation of local initiatives.

Policy dialogue is needed to support the concept of national rural, forest and pastoral codes which lay out the basic guidelines for access and use but enable local modification of the code for specific implementing features. A major issue is the role of the Forestry Service as a protector of the natural resources base and as a promoter of its rational use. Currently, institutional incentives are almost entirely weighted towards enforcement. Receipts, other than budgetary allocations, are primarily from fining and the percentage of capture of user fees is low. If local resource management areas are to spread beyond their points of initial testing, policies and implementing agencies will have to change towards greater local control and responsibility for resource use and protection. The Forest

Service's role needs to move towards one of direct management of national reserve areas, regulation of use of other land areas through user fees and licensing and promotion of better resource management by local organizations and private concessionaires.

Donor Coordination

Two areas are central to donor coordination for natural resources management purposes--policy dialogue to encourage institutional and legislative reform and support to the test zones of the PNLCD. Donor effort is needed to reinforce the current GRM initiatives to test and implement policy changes to move from a nearly-total enforcement approach to a user fee and sustained use approach to resource code development and administration. Participation in the Tropical Forestry Action Program for Mali is an immediate target of opportunity for USAID and other donors.

The second major area for donor coordination should be the joint monitoring and review of the test zone component of the PNLCD. Donors are taking different approaches to the test zones ranging from a slow experimental process (the World Bank) to modification of existing programs (the approach recommended here) to more direct intervention (the PRC). As the test zones are intended to develop models of broader application, donor roundtables with the GRM should continue to be regular affairs examining both technical approaches and the implications of the results of test zone work for further donor assistance.

Monitoring and Modifying the Action Program

The Action Program is designed to address the major concerns of each of the major actors in natural resources management in Mali: the GRM, the farmers and the donors. Before there is widespread adoption of LMS's, farmers must be reasonably confident that technologies and other conditions are viable and do not entail excessive risk. Host governments need to have some assurance that modification of national laws in the context of LMS's will not lead to further degradation of the resource base and that on-farm recurring costs can be covered by benefits. Donors must have a way of monitoring the impacts of their investments.

Perhaps the best way to institutionalize the monitoring and adjustment process is to train technicians and managers in natural resources management. At least in the near-term, even the best strategies will have effect over limited areas where development projects are active. Monitoring and evaluation units of existing projects and research organizations should be able to assess change in these areas. This effort needs to be seconded by a broad, but relatively inexpensive, monitoring approach that can be maintained for decades. Section 4.6 outlines an approach based on remote sensing which can be employed for much of the country. This effort, and broader programmatic monitoring, probably needs to be undertaken by a national structure within the Ministry of Environment and Animal Husbandry as part of its responsibility under the PNLCD.

The pastoral zones and the riparian environments were not studied as part of this Action Program. USAID investment has provided substantial insight into the livestock and pastoral issues and is helping to move the public sector towards a user-fee for service

approach. Until veterinary and marketing privatization efforts have been consolidated, the national institutions will not have the capacity to undertake a major pastoral resource management program. New donor financing for the pastoral zone is anticipated and this experience should be carefully monitored to identify promising interventions. The riparian environments are one of the major topics of the Tropical Forestry/Biological Diversity Assessment which is contained in an independent report.

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Any errors in fact or interpretation are the fault of the team. This report presents the opinions of the authors, not necessarily the views or policy of USAID or the Government of Mali.

GLOSSARY

AAPL	Approved Assistance Planning Level
ACDI	Agence Canadienne de Developpement International (CIDA)
ADB	African Development Bank
AFSI	US Peace Corps African Food Systems Initiatives
AJAC	Association des Jeunes Agriculteurs de la Casamance (Senegal)
CARE	Care and Relief Everywhere (USA)
CCCE	Caisse Centrale de Cooperation Economique (France)
CILSS	Comite Inter-Etats pour la Lutte Contre la Secheresse dans le Sahel
CDSS	Country Development Strategy Statement
CLUSA/ NCBA	Cooperative League of the USA/National Cooperative Business Association
CMDT	Compagnie Malien de Developpement des Textiles
DHV	Projet de Developpement de la Haute Vallee (USAID)
DNEF	Direction Nationale des Eaux et Forets
DRSPR	Direction de Recherche sur les Systemes de Production Rurale (Farming System's research directorate supported by a variety of donors including USAID and the Dutch)
EPRP	Economic and Policy Reform Project
FAC	Fonds d'Assistance et Cooperation (France)
FAO	United Nations Food and Agriculture Organization
FLUP	Forestry and Land Use Project (Niger)
FSDP	Farming Systems Development Project (USAID)
GON	Government of Niger
GRM	Government of the Republic of Mali

GTZ	German Technical Assistance (FRG)
IBRD	International Bank for Reconstruction and Development (World Bank Group)
ICRISAT	International Center for Research in the Semi-Arid Tropics
IER	Institute d'Economie Rurale
ILCA	International Livestock Center for Africa
INRZFH	Institut National de Recherche Zootechnique, Forestiere, et Hydrobiologique
ISH	Institut du Sahel-Hydrobiolgie
ISNAR	International Service for National Agricultural Research
IUCN	International Union for the Conservation of Nature
LMS	Local Natural Resources Management Strategy
LSP	Livestock Support Project (USAID)
NGO	Non-Governmental Organization
NRM	natural resources management
NRMS	Africa Bureau's Natural Resources Management Support Project
ODIK	Operation de Developpement Rural Integre de Kaarta
ODR	Operation de Developpement Rural
OHV	Operation de Development Rural de la Haute Vallee
OPRS	Swiss Farming Systems Research Project
ORSTOM	Office de Recherche Scientifique et Technique Outre-Mer (France)
OXFAM	Oxford Famine Relief
PIRT	Projet d'Inventaire des Ressources Terrestres (USAID)
PNLCD	National Plan of Anti-Desertification and Desert Encroachment Control
PNRM	Africa Bureau's Plan for Natural Supporting Resources Management in Sub-Saharan Africa
PRODESO	Malian State Livestock Development Organization for the Sahelian Zone

PRC	People's Republic of China
PRMC	Mali Cereals Marketing Reform Project (USAID)
PVO	Private Voluntary Organization
RFA	Republique Federale Allemand (FRG)
SAFGRAD	Sahelian Africa Food Grains Research and Development Program
SSRA	Sahel Sub-Regional Natural Resources Management Assessment
SWMU	Gambia Soil and Water Conservation Management Unit
TFAP	Tropical Forestry Action Plan
UNDP	United Nations Development Program
UNSO	United Nations Sahelian Office
USAID	U.S. Agency for International Development
VRP	Village Reforestation Project

1. INTRODUCTION

1.1 Background

This report contains the proposed USAID Action Program For Natural Resources Management (Action Program) in Mali. The Action Program is mandated by the Africa Bureau's Plan for Supporting Natural Resources Management in Sub-Saharan Africa (PNRM). The PNRM was developed to "... better articulate and coordinate A.I.D.'s approach to Sub-Saharan Africa's environmental problems - desertification, soil degradation, loss of biological diversity - with its strategic goal of increased agricultural productivity ...". The PNRM guides A.I.D. efforts to improve natural resources management (NRM) by "... establishing priorities to facilitate the best use of limited resources."

The starting point for each Action Program is the question: what is required to achieve sustainable agricultural development within a twenty-year time frame over a significant area in a given country? From this comprehensive focus of the PNRM, Action Programs are to recommend short-, medium- and long-term strategies for balanced protection, restoration and enhanced use of the soil, water, vegetation and genetic components of the resource base of the major ecological zones of Africa. The Action Programs are developed according to the following guidelines:

- The program should be viewed as tentative, that is, developed without regard to projected Mission approved assistance (AAPL) or staffing levels.
- Budget and staffing concerns will be considered as separate issues.
- The tentative Mission Action Programs will be technically based on the findings and recommendations of natural resource management assessments.
- It should provide clear direction for A.I.D. assistance for the short-, medium- and long-range management and rational use of the country's natural resources.
- It should be specifically tailored to the priority natural resources concerns of the host country and the PNRM.
- To satisfy the need for A.I.D. to evaluate NRM investments, the Action Program should also include monitoring components to determine the effects of the investments on agricultural productivity and the natural resources base.

The Action Programs developed using these guidelines are employed by Missions to prepare the natural resources management section of their Country Development Strategy Statements (CDSS) and the annual updates to the CDSS.

1.2 Development of the Mali Action Program

The Action Program for Mali is based on the findings of the Sahel Sub-Regional NRM Assessment (SSRA) that was conducted in late 1987 to identify promising natural resources management activities and describe the conditions under which they had

successful outcomes. The SSRA concentrated its efforts in Senegal, Gambia, Mali and Niger on the arid/semi-arid zone and the sub-humid upland zone. It also examined the riparian and lacustrine environments of the major regional river basins. The SSRA found that, despite a generally deteriorating environmental situation in the Sahel, a small but growing number of farmers are making financial and economic gains. The major question raised by these findings is how regional governments, donors and farmers could work together to diffuse these empirical successes over a substantially wider area? (See Annex 9)

In Mali, a series of actions have been undertaken to seek an answer to this question. Since the SSRA, the Africa Bureau's Natural Resources Management Support Project (NRMS) has assisted the Mali Mission to conduct an economic analysis of the Village Reforestation Project (VRP) extension, to assess the natural resources management components of the Mission project portfolio for the CDSS and to formulate local resource management strategies. The Action Program mission of November 1988 used the local resource management strategies developed to test assumptions about technologies, implementation arrangements and fit with Government of Mali (GRM) policy and programs. A joint USAID/GRM/NRMS team studied natural resources management policy and programs and explored Action Program issues and options with a full range of GRM, donor and non-governmental organizations. A list of organizations contacted is given in Annex 10.

The joint team developed an Action Program for Mali which presents scenarios for the adaptation and extension of local resource management strategies identified in the SSRA and elaborated through subsequent field work. It also provides the estimates of the total costs of implementing the strategies over substantial portions of the semi-arid and sub-humid zones of Mali.

The following sections:

- o discuss the GRM's major natural resources policy instrument, the National Anti-Desertification Plan;
- o give the key findings of the Sahel Sub-Regional Natural Resources Assessment; and
- o present the AID Action Program for Mali.

2. THE GRM NATIONAL ANTI-DESERTIFICATION PLAN

2.1 Plan Development

The droughts and general decline in overall rainfall levels which began in the Sahel in the last years of the 1960's led to the mobilization of major national, regional and international efforts in relief and development. Review of past programs with the assistance of the UNDP, UNSO and USAID led to the adoption by the government of the National

Plan of Anti-Desertification and Desert Encroachment Control (PNLCD) in October 1985. A joint GRM/CILSS/Club du Sahel mission in November 1985 identified a set of programs to support this plan. In 1987, the PNLCD was translated into eight large programs. The eight programs are intended to orient GRM and donor assistance to the solution of the problems of desertification and desert encroachment. They lay down the following thematic orientations for policy and project development:

1) Design and execution of land use management approaches for Mali's major agroecological zones;

2) Development of a mosaic of revegetation and use actions to constitute a "Green Dam" against desert encroachment and "Green Belts" against loss of vegetative cover and soil erosion in the areas around major population centers;

3) Monitoring, evaluation and coordination of anti-desertification actions through a National Center for the Study and Monitoring of Desertification;

4) Training, information and extension in conservation land management for rural populations and field services;

5) Creation of a National Research Center (or program) on Desertification;

6) Reorientation and integration of land use management actions in the regional Rural Development Organizations (Operations de Developpement Rural or ODR);

7) Economics, public policy and management of fuelwoods and other renewable biomass sources of energy;

8) Supporting measures of legislation and public administration, including revision of tenure legislation, administrative regulation of taxes and fines and administrative reform.

In 1987 and 1988, major donor assistance was used by the GRM to undertake field and prefeasibility studies. Some of the major efforts to date are given in Annex 8.

2.2 Programs Linking the Mali Action Program with the GRM Anti-Desertification Program

The objectives of the PNRM described in the introduction and the guidelines resulting from the SSRA in terms of the primary criteria for sustainable resource management led to selection of five of the eight programs of the PNLCD suitable for support by USAID. These programs and the rationale for their inclusion are:

1) Design and Execution of Land Use Management Approaches

The "test zones" identified in this program provide sites in which action program strategies can be applied in areas where USAID has an established presence and ongoing projects, the Second and Fifth Regions.

4) Training, Information and Extension in Conservation Land Management

The emphasis on training of rural populations and field agents provides an opportunity to influence the type of training and extension offered and should foster the expanded use of techniques found in existing AID-funded projects and NGO activities.

5) Creation of a National Research Center (or program) on Desertification

AID support to both national research institutes and the recently initiated effort to define Mali's long-term national agricultural research plan provides a major opportunity to influence the institutional structure and the programmatic content of land management research in Mali.

6) Reorientation and Integration of Land Use Management Actions in the Regional Rural Development Organizations

The ORD's are the principal instrument for geographically focused rural development investment. They already undertake some integration of production and natural resources management e.g., the ground rock phosphate, composting and run-off control activities within the Operation Haute Vallee (OHV). This integration can be strengthened in the near and medium term given the political will and commitment to do so.

8) Supporting Measures of Legislation and Public Administration

Public land use and tenure policy is a major issue area in Mali. The basic forestry code dates, with some revisions, to 1935. Local action on resource management and use problems is impeded by arbitrary enforcement of regulations which are, in some instances, inapplicable or have the reverse of the impact intended by legislation. AID has some powerful tools to influence policy change and to support its implementation e.g., the Village Reforestation Project (VRP) in the Vth Region, and the Economic and Policy Reform Project (EPRP).

3. OVERVIEW OF THE MALI ACTION PROGRAM

Based on the guidelines of the SSRA, the Mali Action Program incorporates local resource management strategies (LMS's). The LMS's are approaches to sustainable development built of components collected during the SSRA and from other experience. The technical, organizational and financial elements of these strategies have been combined with supporting measures to support their extension to a significant portion of the population in the semi-arid and sub-humid agroecological zones of Mali. The LMS's have

as an objective the sustainable development of large surface areas. Given the spread of conditions across these areas, the underlying assumptions of the strategies need to be examined at the time they are translated into a field activity. The LMS's can help project designers test the completeness of their designs. The strategies can be modified to meet the needs of different environmental settings.

Estimated costs and returns have been developed for the LMS's in each of the following areas: millet/sorghum production areas in the semi-arid zone, cotton/maize production areas in the sub-humid zone, areas of high water tables in both zones and areas in both zones where natural forest management would be suitable for sustainable production of wood and forage. The Mali Action Program does not include local resource management strategies for the riparian areas in the Inner Delta of the Niger River and the arid pastoral areas of the country.

Besides the findings of the SSRA, the Action Program is based on the GRM's Anti-desertification Program, especially the "test-zone" and "terroir villageois" concepts.

The Action Program is aimed at farmers participating in LMS implemented through farmer groups. It is recognized that individual farmers could benefit from the technologies, but long-term and widespread benefits depend upon developing local institutions and agreements among groups of farmers, herders, etc.

Finally, the Action Program is designed to address the major concerns of each of the major players: the GRM, the farmers and the donors. Before there is widespread adoption of LMS's, farmers must be reasonably confident that the technologies and conditions of the OMP's are viable and do not entail excessive risk. Host governments need to have some assurance that modification of national laws in the context of LMS's will not lead to further degradation of the resource base and that on-farm recurring costs can be covered by benefits. Donors must have a way of monitoring the impacts of their investments, especially long-term impacts.

3.1 Addressing Farmer Concerns

The major costs of the Action Program come from the development, verification and extension of LMP's aimed at assisting farmers to make informed decisions about investing in his homestead. In the development and verification phase, select farmers receive technical and material assistance to use promising technologies on their homestead to increase productivity of food, fiber, wood and forage. The local testing of management plans are based on the team's understanding of the "Test Zone" program in the GRM's Anti-Desertification Plan.

In the deployment phase, these model homesteads serve as demonstration sites that allow farmers to make informed decisions about whether to participate in LMS's. To deploy LMS's to other areas, the program budgets for training and mobilizing GRM field agents.

In order to assist in institutionalizing ways to offset future recurring costs, the Action Program includes strategies to capture a portion of the benefit streams to pay for annual inputs.

The components of the LMS aimed at increasing incentives for on-farm adoption of sustainable production technologies include the following:

- o Extension and training programs that increase farmer-to-farmer contact and provide on-farm follow-up;
- o Support for local farmers' groups that accumulate and invest capital in management of soils and vegetation;
- o Tax and tenure policies that increase benefits for farmers participating in the LMS;
- o Strengthening of public and private institutions that support participating farmers;
- o Financial support that provides participants with loans and grants during the initial 2 to 3 years, as with the provision that a portion of the benefit stream repays the loans over a 4- to 5-year period:
- o Technical assistance for extension of technologies that have short-, mid- and long-term impacts on soil fertility, soil conservation, vegetation management and habitat conservation.

3.2 Addressing GRM and Donor Concerns

Both the GRM and donors need assurances that their investments will give reasonable returns and that benefit streams are sufficient to cover the costs of most, if not all, of the recurring on-farm inputs (agroforestry, composting, mineral fertilizers, water catchments, etc.). To ensure that tenure and tax policy modifications under the LMS's do not lead to increased erosion and loss of trees and shrubs, participating farmers must comply with the terms of the management plans or lose the benefits of the LMS's.

Actions and conditions addressing GRM and donor concerns include the following:

- o Support for GRM decision makers to visit the sites of promising initiatives, either in Mali or neighboring countries, to be able to make an informed decision about policies and other components of local management plans:
- o Stipulation that participating farmers comply with the local management plans or lose the benefits under the plans (compliance may include long-term investments in soil fertility, soil conservation and vegetation management);

- o Provision to provide GRM extension agents with training and transport; and
- o Establishment of milestones and monitoring systems to track the impacts of investments, especially long-term.

3.3 General Components of the Action Program

3.3.1 Component One: Supporting Extension Systems that Allow Farmers to Make Informed Decisions about Adopting Strategies for Sustainable Development

The SSRA showed that: (1) farmer-to-farmer contact is extremely effective in allowing farmers to make informed decisions; and (2) on-farm follow-up is necessary to assist farmers in adopting technologies. The following vignettes in Volume II of the SSRA support these observations:

In 1985, 14 farmer leaders were taken from the Koro Region of Mali to visit farmers participating in the CARE/Niger Majjia Valley Windbreak Project. In 1987, agroforestry activities were being conducted in more than 80 villages in the Koro region. Besides the farmer-to-farmer contact made during the trip, farmers in the Koro area received regular support from CARE and GRM personnel to adapt technologies to their homesteads.

A few years ago, Angel Togo, a farmer in the Fifth Region of Mali, received assistance from GRM personnel in the VRP in establishing a woodlot. After a couple of years of technical and material assistance, Togo runs a very profitable pole operation. He has served as an example to more than 100 neighbors who are now engaged in some form of reforestation.

In 1972, a handful of farmers initiated private woodlots in the Majjia Valley under the direction of the GON and donors. Private woodlots are now extensive in the Majjia Valley. In the last few years, farmers from the Tessaoua area initiated woodlots after visiting the Majjia woodlot entrepreneurs. CARE/Niger provided both the transport and on-farm support for the Tessaoua operators.

Forest Land-Use Planning Model Site at Guesselbodi

Extension Actions Incorporated under Component One

1) Farmer-to-Farmer Visits for Extension of Agroforestry in Koro, Mali

Because of farmer-to-farmer visits and subsequent follow-up, farmers in 80 villages in the Koro region of Mali are experimenting with agroforestry techniques on a self-help basis. Forty-two village nurseries are supplying seedlings. In 1985, fourteen farmer leaders and several extension agents visited the Majjia Valley (Niger) Windbreak Project. They were accompanied by CARE-Mali foresters who were working in the region. The farmer leaders saw first-hand the windbreak systems and discussed the impacts of the windbreaks

with farmers in the project. Persuaded by the visit that windbreaks could have a positive impact, the farmer leaders worked with CARE-Chad personnel to establish vegetation strips in their own villages, By 1987, windbreaks and other agroforestry initiatives had spread to 80 villages. It is important to note that CARE has provided continual technical assistance since the trip. There is no food for work or other remuneration.

2) Farmer Leaders for Extension of Private Woodlots, Bandiagara, Mali

Nearly a hundred farmers have established woodlots in the Bandiagara region of Mali subsequent to the financial success of a four-hectare pole plantation of Angel Togo, a private farmer. Togo received technical assistance and plastic bags from GRM forestry agents working in the Village Reforestation Project.

3) Farmer Visits for Extension of Private Woodlots, Tessoua, Niger

Farmers in the Tessoua region of Niger reportedly have established private pole plantations subsequent to visits to woodlots in the Majjia Valley. The GON and CARE-Niger sponsored the farmer-to-farmer visits and followed up with technical assistance and some materials. The woodlot operators in the Majjia Valley have clear usufruct rights to the poles. The Tessoua farms clearly perceive that they have the same rights.

4) Pilot Actions for Extension of Water Catchments, Yatenga Province, Burkina Faso

Nearly 5,000 farmers reportedly have adopted water catchments on their land in the Yatenga Province eight years after the first were initiated on a few farms. Extension has been primarily from farmer to farmer.

3.3.2 Component Two: Supporting Farmer Groups that Accumulate and Invest Capital in Sustainable Development

The SSRA showed that farmer groups will form if there are incentives and training available. This was true even in the case of ethnic groups that were not generally considered to form collaborative groups. The role of the groups would include managing delivery of inputs to farmers, collecting portions of the benefit stream to repay loans and developing local management plans in collaboration with the GRM and donor personnel.

Examples:

Accumulation and investment of capital in the land are necessary elements for sustainable development. Here we look at examples of farmer groups that have accumulated capital and, in some cases, have made investments in the management of the land and soil.

1) Grain Banks for Establishment of Water Catchments and Agroforestry in Yatenga Province, Burkina Faso

In 1984, grain banks were established in about 20 villages to help pay for

construction of water catchments. Oxfam loaned grain to participating farmers. The catchments substantially increased grain yields on a number of farms and a majority of farmers repaid the loan in kind. These banks have continued to be used to loan for construction of additional catchments and, reportedly, for establishment of agroforestry initiatives. They are managed by village leaders.

2) Ouelessebougou "Tons" for Collective Accumulation of Capital, Mali

Income fromn the common fields of tons in the town of Ouelessebougou has been used to construct a training center for farmer leaders. These farmer leaders receive training on improved natural resources management, among other topics. Tons are traditional age-grade organizations that work on common fields to raise capital for projects addressing the common good.

3) Woodcutters' Association at Guesselbodi, Niger

Under the Forest Land Use (FLUP) Project, the Woodcutters' Association accumulates capital, part of which is reinvested in the management of the Guesselbodi forest and part of which has been used as collateral for purchase of carts to haul wood.

4) The Koumpentoum Entente, an Association of Village Subcommittees (Senegal)

In the village of Diam-Diam, members of the Entente Subcommittee are reforesting over a hundred hectares of land, operating a nursery, reintroducing native tree species, operating a collective granary, systematically manuring fields with a collectively-managed herd of cattle and creating nuclei of individual goat and cattle herds through management of a co-owned herd. Neighboring Entente villages have sold poles from woodlots and it is expected that Diam-Diam will be doing the same shortly. The Entente is an umbrella organization of village subcommittees that undertake a number of natural resources management enterprises. It originated in 1974 based on a determination to do something about the environmental degradation that was perceptibly growing. Its development was guided by Mr. Muhamadou Cissoko, an exceptional Senegalese extension agent. Entente members invest 10,000 FCFA per year and donors provide some funds and technical assistance.

<u>Farmer Group Initiatives Included in LMS'</u>

1) Financial support for initial input stocks;

2) Organizational assistance and management training from PVO's.

3.3.3 Component Three: Provision of Tax and Tenure Incentives for Participating Farmers

The SSRA showed that farmers having tenure and usufruct rights over land and trees increase long-term investments. But, other assessments show that these rights should

be provided only in the context of management plans and only to complying farmers. Modification of tax structures could also improve management of natural resources. If, for example, fuelwood harvested under a management plan (such as the FLUP Project in Niger) was taxed at a lower rate than wood from non-managed land, the incentive to adopt management practices would be clear.

It was noted in the SSRA that most tenure and usufruct policy changes having an impact on management of soils and vegetation were in the context of local initiatives. Thus, the Action Program does not aim primarily at policy dialogue to establish nationwide laws. (It is not clear that nationwide tenure laws not supported by institutional change and technical and material assistance would always have the desired effects.) Rather, it twins policy modification with technical and material assistance delivered to participating farmers.

The role of the national decision makers is, of course, vital to this process. The Action Program proposes site visits and workshops to discuss the impacts of local policy modification. GRM extension agents supported in the Action Program would also be charged with ensuring compliance by participating farmers.

Examples of farmers responding to improved tenure and usufruct rights:

1) Djenne (Mali) Private Gardener

Mr. Bere Younou, a mason and gardener, operates a commercial garden near the town of Djenne. He receives income from melons, peppers, hibiscus and sweet potatoes for the local market. He has planted mango, citrus, papaya, banana, guava, cashew and grenadine trees which will bear in a few years. Mr. Younou operates his enterprise on land that had been abandoned as unusable for agriculture. Topsoil that once produced sorghum had been eroded away leaving only mottled clay that had little apparent value to nearby villages. To rebuild and protect the soil, he has transported manure, constructed contoured dikes and established living hedges. But, before he made these investments, Mr. Younou obtained an administrative permit granting him use rights on the land. The commercial promise of this garden has attracted local attention and others are in the process of trying to procure use rights for other abandoned parcels.

2) The "Bouna" Agreement (Niger)

Through conflict-resolution negotiations mediated by the IUCN, livestock herders, fishers, farmers and local traditional authorities have tentatively agreed to a process of determining common property access rules in the Niger Inner Delta. This process, which still needs final GRM approval to be binding, has been advanced by empirical evidence that collaboration amongst the various parties provides mutual benefits. For example, preservation of heron nesting sites increases guano that increases fish populations; goat herders receive increased forage rights in exchange for ceasing to cut certain tree species; farmers have more reliable flocks of storks for locust control; and the GRM fulfills its RAMSAR goal of protecting wetlands.

3) Government of Niger Agreement at Guesselbodi

By sharing benefits from the Guesselbodi National Forest Management Plan with the Guesselbodi Woodcutters' Association, the GON has created a sustainable NRM system. Association members agree to: (1) harvest according to the sustained-yield management plan developed under the FLUP Project; and (2) pay for management of the National Forest out of the harvest revenues. Two thousand hectares are now being managed in this fashion. The impact of this model site promises to be substantial--management plans are being drawn up to place 100,000 hectares under management within the next few years.

Sample tenure actions:

1) Visits to sites with modified tenure and usufruct by GRM decision makers;

2) A land tenure workshop to discuss impacts of policy and tax.

3.3.4 Component Four: Strengthening Public and Private Institutions that Support Participating Farmers

Public sector field services must have the skills and the operating means to help farmers adapt technologies to their production systems. The SSRA showed that strengthening of existing technical services in the integration of natural resources management with agricultural production was a necessary step to successful activity implementation. Training had to be combined with operational support to initiate an extension- oriented set of activities by forest agents. Specialized training modules developed by projects in Mali and neighboring countries have been effective in upgrading the skills of agricultural and forest service agents. Further, SSRA found that local revenues to support enhanced technical field services can be generated by fees, licensing and leasing operations. In most cases, these fees were managed by local groups. Private institutions, such as NGO's, were also important in providing services to farmers and also required technically skilled individuals to work with farmers. The LMS's include training and operation support as an initial step in deploying the Action Program elements. For some existing projects and PVO programs, incremental costs can be quite low when funding can be refocused to incorporate new training elements in established training and refresher course cycles.

Examples of Strengthening of Public and Private Institutions:

A number of examples show that adequately-supported extension agents can make major impacts in replicating cost effective NRM technologies.

1) Supporting Extension Under the Village Reforestation Project (Mali)

Because of innovative support from the GRM and USAID/Mali, GRM Forestry Agents have assisted hundreds of farmers in the Fifth Region of Mali to establish private pole plantations, living hedges, windbreaks, private orchards, improved stoves, contoured dikes and private nurseries. Impressive returns from these farmer investments have induced

other farmer entrepreneurs to replicate the above initiatives. The primary investments from the GRM and USAID include provision of transportation, training and per diem to the agents. In addition, agents involved in extension work no longer have responsibility to fine farmers for illegal wood cutting. But, in many cases, the need to do this is diminished because the woodlots are protected by the farmers themselves. (At some point, the value of the work done by farmers through the work of these agents should be compared to the revenue collected in fines for the same period.)

2) Agents Trained in Forest Land-Use Planning (Niger)

Under the FLUP Project, agents are trained to inventory the standing volume of vegetation, develop sustained-yield management plans and work with participating villagers to monitor the plan. Currently, agents are working on nearly 100,000 hectares of forest land that is, or is planned to be, jointly managed by the GON and village associations. The costs of management come from the revenues collected under the plan.

3.3.5 Component Five: Provision of Financial Support for Investments that have Long-term Impacts on Soils and Vegetative Cover

Sustainable development depends upon supporting actions that have long-term impacts on soil fertility, soil conservation, vegetative cover and germ plasm preservation. The SSRA showed that few farmers are in a position to support these actions without support. For example, mature Acacia albida trees dominate the farmlands of much of the millet and sorghum areas of the four countries visited, but regeneration is weak. When farmers were asked why they did not put efforts into protecting young seedlings, a frequent response was that there is too much pressure on the land and the pay-out period for maintaining trees was too long. The long-term cost of not protecting young acacia albida trees is high in terms of lost soil fertility and forage production, but it will be paid by another generation. To overcome this dilemma, the Dosso (Niger) Acacia Albida Project shares the costs of protecting young seedlings by giving farmers $0.15 per seedling that survives. Other projects provide farmers with food for work (Keita, Niger) and free seedlings.

Actions Incorporated in Resource Management Strategies

Windbreak and Acacia Albida plantings are part of the local resource management strategy for participating farmers. Participating farmers are provided with loans for seedlings and cost-offsets for protecting seedlings during the first two years. The loan is repaid from a portion of the income from increased production. The period of repayment would be over a three- to four-year period.

The incentive for taking long-term impact initiatives is the short-term production benefits from early input supply. Farmers not complying with the longer-term management plan would be dropped from the program.

3.3.6 Component Six: Provision of Technical and Material Assistance for On-Farm Adoption of Economically-Sound Technologies that Improve Soil Fertility, Increase Soil Fertility, Increase Soil Conservation, Increase Vegetative Cover and Conserve Habitats for Preservation of Germ Plasm

This component describes the actions to achieve short- and long-term impacts on the above parameters. The actions were selected based on a general approach to meeting the technical criteria of the Action Program and for calculating a budget. It is understood that the size of the impacts of any of the actions below are site specific and that alternative actions would be more appropriate for particular sites.

Soil Fertility Actions

- o Short-term: Mineral phosphate, nitrogen and compost;
- o Long-term: Acacia albida.

Soil and Soil Moisture Conservation Actions

- o Short-term: Contour dikes and water catchments;
- o Mid-term: Living hedges;
- o Long-term: Windbreaks or vegetation strips.

Vegetation Management for Production of Wood and Forage

- o Natural forest management;
- o Pole plantations;
- o Management of windbreaks for poles and forage.

Conservation of Habitat and Germ Plasm

- o Sacred woods (Mali);
- o Moving germ plasm from northern areas to areas where drought has decreased the viability of higher rainfall varieties;
- o Medicinal and traditional plant gardens.

4. ACTION PROGRAM COMPONENTS

This chapter begins with a presentation of four local resource management strategies (LMS's). It concludes with recommendations for research, policy dialogue and monitoring and modification of the Action Program.

4.1 Local Resource Management Strategies (LMS's)

Action Program strategies have been developed for the semi-arid zone and the sub-humid zone in Mali, as well as two specific environments, the high-water table areas and the savanna woodlands, which are found in both zones. The SSRA did not study natural

resources interventions in the Sahelian-Saharan transition zone where pastoral activities dominate, nor make extensive study of the riverine and delta fisheries. The last two areas will be the subject of national attention in Mali through the Test Zone program of the national anti-desertification program (PNLCD), PRODESO with upcoming ADB financing, USAID's Livestock Project and through research programs under definition as part of the IBRD/ISNAR/USAID-supported restructuring of the national agricultural research system. This Action Program recommends a geographical focus on the two southern agroecological zones of the country with expansion to the more arid zones over time as a better base of experience is developed from the Green Barrier and Test Zone interventions of the Anti-Desertification Program and from applied research. The following sections present the strategies developed from the results of the SSRA. Each section presents the:

- o zonal extent and rationale for the strategy;
- o crop, livestock or forest output which provides the economic engine for the strategy;
- o short-, medium- and long-term incentives supporting the strategy;
- o technical components integrating agricultural production and natural resources actions;
- o training and extension support for the strategy;
- o organizational approaches to implementation;
- o institutionalization of the strategy;
- o policy areas which affect success of the strategy;
- o anticipated adjustment of the strategy over time.

Each strategy is briefly described below. They are not intended to be project plans, but well-detailed approaches which can be used in future programming of both GRM and donor projects. In some cases (DHV, VRP), strategies can be implemented through refocusing existing activities or through marginal added support. As each LMS contains a set of assumptions which will vary across the targeted area, it is important that the GRM, AID and other donors critically evaluate and modify the assumptions to meet the circumstances of the areas in which they are working.

Annexes 3 through 6 present the more detailed assumptions and financial analyses of the strategies. They are also available at USAID/Mali in diskette format as spreadsheets to encourage USAID, GRM and others to adjust the strategies for their own needs. The numbers in the annexes represent the Action Program team's best estimate of the total costs and returns to implementing the strategies. The cost estimates should be close to the maximum cost of strategy execution, because they disregard existing GRM and donor commitments to services and projects. Discounting costs to reflect existing investments was

far beyond the scope and the time available to the team.

4.2 The Sub-Humid Zone Strategy

4.2.1 Zonal Characteristics

The Sub-Humid Zone of Mali is found between the 600 and 1,200 millimeter rainfall isohyets (post-1969). It is the zone of greatest agricultural productivity, highest population density and the largest and most important areas of forest reserves and national parks. With recurring drought, soils in this zone have come under increasing pressure from cash crop production, vegetation suffers greatly-increased grazing pressure from local and transhumant herds and forest reserves are under pressure for wood and for hunting. Surface relief makes substantial parts of this zone susceptible to high early season run-off and soil erosion. The importance of the watersheds in this zone, for power supply to Bamako and regulation of river levels for the Office of Niger irrigation systems, underline the need for continued attention to the management of the vegetative cover. This part of the country has received large donor financial flows for the intensification of cereal and cotton production, animal traction and forest planting. Both the Operation Haute Vallee (OHV) and Compagnie Malienne de Developpement des Textiles (CMDT), the Dutch DRSPR and the Swiss OPRS project carry out activities supporting improved resource management at the farm level. The SSRA identified a series of local initiatives which apply to this zone, which were effective in controlling soil and water erosion, recharging the shallow groundwater table and improving soil fertility through the use of compost, among others. Natural forest management activities, grazing land lease agreements and organizational interventions were seen in Senegal, The Gambia and Niger which also apply to this zone.

4.2.2 Time Horizon

Over a twenty-year period, the strategy is seen as capable of affecting about 500,000 hectares of farm and woodland in the sub-humid zone. Effects at the individual holding level would be longer economic life span of fields, higher water holding capacity of soils and increased availability of improved forage for home consumption and sales. At the watershed level, decreased early season run-off, better shallow groundwater recharge, slower rates of land clearing and more even distribution of transhumant herds on wooded grazing lands would be seen.

4.2.3 Economic Engine

The strategy is driven financially by the increased production and sales of wood and hay from jointly- managed improved natural forest land. Based on experience in Niger and Burkina Faso, expected wood products would range from fuelwood and poles to saw logs and hay which would be cut and sold after seeding (Guesselbodi, Niger experience). The local markets for hay from grasses and legumes appears to be strong in areas where animals are stabled for traction and traditional confinement systems are used for small ruminant production for fattening of animals for religious holidays. Recent experiences with cereals banks in Mali's sub-humid zone show that grain is stored and, in many cases, used to

generate benefit streams for investment (e.g., Save the Children/UK, PRMC). For fuller details on inputs and outputs, see spread sheets in Annex 3.

4.2.4 Incentives

Short-term incentives to farmers include increased crop returns from maize, cotton and corn and improved access to surface and groundwater. Medium-term incentives include decreased conflict over local grazing resources, returns from the sale of forage, poles and, perhaps, livestock. Long-term household incentives include increased sale of fruit tree and wood products. The incentives for farmer groups over the near term would be increased security of productive investments as well as hay sales. Over the medium-term, greater income from wood sales and decreased pressure to extend cultivated areas would be added. Over the long term, more reliable access to seasonal forage and increased offtake or value of wood products would serve as added incentives to continued cooperative resource management.

4.2.5 Technical Initiatives

On-farm initiatives where SSRA observed them include:

- o the use of rock phosphate (OHV and CMDT);
- o compost/urea (OHV and CMDT);
- o contour ridges, stone dikes (Sikasso);
- o planting of field trees (karite, nere, Acacia, fruit);
- o gully plugs to retain water for recharge, local watering of fruit trees and gardens (Sikasso).

Woodland initiatives observed under joint management include:

- o restoration using contour ridging and stand enrichment (Farakou forest);
- o tree planting for firewood and polewood (Guesselbodi - Niger); and
- o Andropogon planting for hay production (Guesselbodi - Niger).

4.2.6 Training and Extension Requirements

OHV, the CMDT, OPRS and the Farming Systems Research and Extension Project all have carried out training and extension programs in this zone. Use of contact farmers and development of training modules for the on-farm activities would be done by building on the base of the training programs carried out by OHV and CMDT, among others (See Annex 9). Training of trainers for improved natural woodlands management could be done at Guesselbodi in Niger, with subsequent training of extension agents programmed at the

Swiss-financed center at Tabakoro in Mali. The Peace Corps AFSI program could provide a source of trainers for the on-farm and forest management activities as proposed in the FSDP (688-0235). Based on past experiences, extension agents would work with 50 contact farmers. Each contact farmer would, in turn, work with 50 to 100 farmers. Training of farmers in village association or cooperative management would be the other essential training element.

4.2.7 Organization

The strategy resides on local organization of village associations, cooperatives or other groups which will undertake group loans to finance on-farm and improved forest management. This organizational model is already used in the OHV and CMDT zones for cotton, other cash crop and cereals production. It will not require modification to enable execution of the strategy. The existence of groups already managing substantial credit flows should enhance the probability of success. The Farakou Forest near Sikasso is an example of group management of a common forest resource (See Annex 9) and the Guesselbodi experience in Niger incorporates the group management of combined restoration, hay production and tree planting and harvesting. Based on the Guesselbodi experience, the local association would manage the loans, hire and pay the forest guards and hire the supplemental daily labor needed to plant and harvest hay. CLUSA/NCBA assistance and Peace Corps volunteers could assist in the development of cooperative management skills and the organization of forest management. Key issues would be the level of farmer effort in forest regeneration, hay planting and maintenance and distribution of return flows from sales of forest products.

4.2.8 Institutionalization

Institutionalization requires that on-farm and woodland activities repay farmers' investments of time and capital, that the cooperative cover its costs and that land use agreements between potentially-competing groups of farmers, transhumant herders and merchants avert conflict of access to forest areas. The financial analysis of the strategy shows that, after an overall average expenditure of $75 per hectare, farmers would, on average, increase farm income to about $1,297 per hectare a year. After the second year of full implementation of short-term NRM strategies, the cooperative would realize an average return of $724 per hectare a year and the initial loan to the cooperative would be paid off after five years (See the spreadsheet in Annex 3). Examples of land use agreements in Niger between sedentary producers and transhumants in access to forage resources include the Bouna convention, the Banamba agreements and CECI-ODIK conflict resolution with agro-pastoral and transhumant groups (See Annex 2).

4.2.9 Policy Changes

Key policy changes include modification of the Forestry Code to permit harvesting of trees in natural forest areas, modification of the Pastoral Code to allow the leasing of forest forage resources by village cooperatives to herders (transhumant or merchant-capitalist) and the recognition of village-level enterprises to manage and exploit forest resources. At the same time, participants receiving usufruct and tenure privileges must

agree to abide by a sustained yield management plan. Suspending the clearing tax on fallow land older than five years is important to the success of the on-farm activities intended to move fields into fallow for forage, wood production and biological diversity. Each of these changes is an example of the need to move from a policy of revenue generation through the imposition of fines to a user-fee orientation (See Section 7). Donors should consider ways to help the GRM value its natural resources base to improve the basis for user-fee calculation and recovery. The first step is to determine the market value of the standing resources of forest and grassland products on local markets. The second is to determine the current level of custodial cost for these resources. Then, an evaluation could be made of the comparative cost of stewardship of these resources through a continuation of the forest police approach or through joint custodial arrangements between the Forest Service and resource users.

4.2.10 Strategy Adjustments

In the sub-humid zone, there is growing competition between the herds of sedentary farmers, larger-scale private herders and transhumant herders. Private, absentee herd owners have become an important element in livestock management over the past period of drought. It will be necessary to track the effect of this proposed strategy on the access of private interests and transhumant herders to grazing areas and to be alert to the potential pressure on the national park reserve areas, if conflict pushes more herders into them. More specifically, the GRM and donors will need to determine the current level of herd utilization of park and forest reserves and monitor whether stocking rates increase as more permanent use of crop land and occupation of adjacent forest land shifts access rights. Medium-term leases of grazing areas within forest reserves may be needed (Guesselbodi, Niger). These leases would need to be managed by the National Forest Service, as their land management implications go far beyond the purview of individual villages or groups of villages.

4.3 The Semi-Arid Zone Strategy

4.3.1 Geographical Focus

The Semi-Arid Zone Strategy (SAZS) is designed for implementation in the Sahelian agro-climatic zone, roughly the area falling between the post-1969 400 and 600 mm rainfall isohyets. This is the area in Mali of most serious environmental degradation and population pressure. The Sahelian agro-climatic zone was the most exhaustively-inventoried region in the SSRA and one which generated a large number of examples of promising NRMS initiatives. In the semi-arid zone, implementation of the strategy should begin on a small scale and build gradually because the zone does not have the density of supporting services, projects and infrastructure as the sub-humid zone.

The SAZS could be implemented through the USAID NGO Grants project. This strategy is appropriate for the Djenne and Diema test zones identified in the GRM's National Anti-Desertification Plan (PNLCD). Currently, CARE and ACDI have planned NRM activities for these zones.

4.3.2 Key Assumptions

A number of assumptions were made to construct the strategy. The local resource management strategy is robust enough to sustain substantial modifications of these assumptions without invalidating the approach. Assumptions can be specified at many scales. The assumptions include:

a) a 500,000-hectare target zone;

b) average farm size of 4 ha;

c) average millet/sorghum yields of 400 kg per ha;

d) average market value of millet/sorghum at harvest of $0.12 per kg with an annual high of $0.30 per kg;

e) a financial discount rate of 10%;

f) grain storage costs $10 per ton per yr;

g) each extension agent is responsible for 2,000 ha or 500 farmers;

h) one Peace Corps Volunteer for every eight extension agents;

i) one co-op agent for every two extension agents (1,000 farmers);

j) one CLUSA agent for every sixteen cooperative agents;

k) new extension agents are trained through Year Fourteen of the project; all agents are retrained annually thereafter.

4.3.3 Time Horizon/Milestones

Based on analyses done in the SSRA, economic impacts from NRM initiatives require a ten- to twenty-year investment. The SAZS strategy has a twenty-year time horizon. Milestones of success occur in the short-, medium-, and long-terms (See Figure 1).

Short Term. Given normal rainfall (400-600 mm), individual farmers implementing the full range of short-term NRM actions and participating in the cooperative co-management plan begin to realize increased yields (400 kg per ha--see, "SSRA: Niger Water and Soil Conservation Initiatives") at the end of Year One of implementation (application of chemical and organic fertilizers and installation of in-field dikes).

Medium Term. The cooperative repays its loan to the donor and begins to constitute a reserve fund and an investment fund in Year Seven of implementation. The cooperative becomes self-sustaining in Year Seven under these projections.

Long-Term. The impact of long-term NRMS interventions on individual farmers' production is felt in Year Ten and increases dramatically after Year Thirteen (windbreaks and field trees [Acacia albida]).

4.3.4 Economic Engine

Essential to all successful LMS's is a financially- attractive, self-sustaining activity, producing sustained benefits for individuals and the collective, some of which are used to invest in productive NRMS interventions which, in turn, increase productivity.

Current project documents in Mali, notably those of the GTZ's agroforestry project in Kayes and ACDI's rural development project in Kaarta (ODIK), report somewhat disappointing results for NRM activities. Notably absent from these programs is the economic element i.e., the inclusion of activities with near-term revenues as incentives to sustained participation and investment. By contrast, local populations have been most enthusiastic about the small-scale economic activities developed through ACDI's local project initiative (Projet Initiatives Locales--PIL), some of which include a resource management component.

In this illustrative SAZS, the engine is a cooperative grain bank. According to local observers, recent experiences in Mali with cereals banks (Save the Children, PRMC, OXFAM in Burkina Faso) have been quite positive from the farmers'point of view. Farmers sell to the co-op the increase in cereals production realized through improved NRMS practices. Income from cereal resales, financed by a loan to the cooperative, is reinvested in short- and long-term productivity enhancing, natural resources regenerating interventions. Farmers sell at 10% above market price at harvest. The co-op sells back to the farmer up to 80% of his/her harvest at 10% below market price during the "hungry season" (soudure). The cooperative realizes a benefit on both the sell-back (27 fr per kg [90% of soudure price] - 12.3 fr per kg [110% of harvest price]) and the 20% of the volume of each farmer's grain it retains. It is important that these assumptions be tested through review of the evidence and through the work in the test zones to examine the seasonal price differential.

Other economic engines identified in the SSRA are possible including poles, commercial natural forest management, small irrigated perimeter development and cash crop production e.g., cotton. Further, there is no reason why the grain bank need remain the only economic activity undertaken throughout the project (SSRA Case: Koumpentoum Entente). See Sections 4.4 and 4.5.

In this illustrative example, the strategy would cost the donor organization and the government $80 million for extension, training and policy dialogue. In addition, $54 million is provided in the form of loans. The grant works out to an average cost of $3.8 million per year. The LMS need not be implemented over 500,000 ha to work. The strategy works if implemented as a whole at virtually any scale. Also, the financial costs are not likely to require totally new financing. Current donor programs and projects, PVO inflows and GRM financing support a number of the components which could be linked together at the local level.

On the income side, the present value of the cooperative return on investment is $1,051 per ha per year while the present value of farm income is $820 per ha per year.

4.3.5 Incentives

Critical to the success of natural resources management initiatives is risk-sharing. In this SAZS strategy, the farmer invests nothing but his/her labor. Investments are undertaken via a loan to the cooperative and the overall grant for training and extension.

Farmers realize increased production in Year One of full implementation of short-term interventions. On-farm productivity again increases dramatically after Year Ten of the strategy. Individual cash returns are realized in Year One of full implementation, then increase dramatically in Year Ten. Food self-sufficiency is stabilized as soon as the grain bank goes into operation.

The cooperative begins to make money in Year Seven of the project and substantial village-wide improvements in natural resources are realized by Year Ten. By Year Twenty, the cooperative realizes $1,018 per ha per year in investment funds.

4.3.6 Technical Initiatives

For demonstration purposes, a small subset of technical initiatives identified in the SSRA are included in this strategy. SSRA results indicated that successful initiatives contained a mixture of individual and collective, short-, medium- and long-term periods of individual payback. Some of each kind are included in the SAZS strategy.

Initiatives with short-term pay-offs include:

- o increased forage production behind dikes (SSRA Case: Guesselbodi);
- o increased cereal production behind dikes (SSRA Case: SWMU; Swissaid; CMDT; DRSPR; also OXFAM, Burkina);
- o increased cereal production and soils quality with organic and natural phosphate applications (SSRA Case: OHV; also ICRISAT and SAFGRAD results);

Initiatives with medium- and long-term payoffs include:

- o polewood production in low-lying areas (SSRA Cases: PREFOCSE; PRECOBA; Angel Togo; Guesselbodi);
- o increased agricultural production and water conservation from windbreaks (SSRA Case: Guesselbodi; Angel Togo);

- o increased agricultural production and improved soils quality and water conservation from field trees Acacia albida, Parkia biglobossa (Serer, Dallol Boboye, Mirria traditional farming systems; research by C. Charreau);

- o improved forest regeneration with community-sponsored forest guards (SSRA Case: Guesselbodi, similar experience in Burkina Faso).

Alternative interventions may achieve similar synergistic results. The mix should, of course, be varied to take into account local conditions and felt needs. Earthen check dams, half-moon microcatchments, V-shaped microcatchments, mini-barrages, alternative field trees, vegetative bands, fire breaks, grazing land improvements and set-asides, etc., may all be used under appropriate site-specific conditions (See Annex 2).

4.3.7 Training

Technical training of extension agents and farmer managers is a critical component leading to the success of this strategy for delivering sustainable natural resources management practices. Three complementary training strategies of model sites, user driven module development, and Training and Visit are discussed in Annex 9. Ongoing (OHV, CARE/Koro) and planned (ACDI Amenagement des Terroirs, CARE/Djenne) NRM activities in Mali make use of each.

4.3.8 Organization

Development of a solid, local organization capable of managing collective initiatives is another requisite to the delivery of sustainable natural resources management practices (SSRA Cases: AJAC and Koumpentoum village associations; Guesselbodi). CLUSA-fostered cooperative organizations are the type case which may be developed from existing cooperatives and "ton villageois" -- the precooperative GRM structure built from the combination of traditional age class organization (See Annex 9).

The strategy may be initiated either through the regional Development Councils with NGO and donor assistance, or through a regional development organization formula such as ODIK or OHV. Private sector operators may, of course, be encouraged to participate in input delivery and marketing activities (SSRA Case: Guesselbodi).

4.3.9 Institutionalization and Policy Issues

Institutionalization of sustainable natural resources management practices emerges from a combination of ad hoc improvements and the intervention of donor and NGO staff in policy formation. This strategy budgets $50,000 for appropriate policy dialogue (SSRA Cases: IUCN Bouna Covenant, Guesselbodi, Majjia Valley). This money would support trips for decision makers to sites where local modification of policy has had positive impact on both farmers and the national Forest Service. Institutional delivery mechanisms and policy issues specific to improved natural resources management in Mali are discussed in Annexes 7 and 9.

4.3.10 Strategy Adjustment

Both long-term expatriate and Malian technical assistance are carried for twenty years. The former could be reduced in Year Five of the project, while the latter could be cut in half after Year Ten of the project. There is also the possibility that good and service delivery could be undertaken by the private sector (phosphate fertilizer, seedling nurseries), as is occurring currently in the OHV in the sub-humid zone and in parts of Niger.

4.4 Bottomland Strategy

4.4.1 Introduction

This strategy can be applied on certain soils in lowlands with a high water table. It combines intensive multistory cropping with building pole production. In Mali, bottomland makes up about 2 percent of the total land area. It is concentrated around the inland delta and other river systems. Much of this type of land is abandoned, flooded, rice-growing land.

4.4.2 Time Horizon/Milestones

The primary benefit stream starts in Year One of implementation with returns from mixed cropping. Cooperative loan payback occurs in Year Five of implementation when the first pole harvest occurs (See Annex 5).

4.4.3 Economic Engine

The economic engine is the production of building poles. The Producers Cooperative is the marketing and transportation mechanism. The co-op buys the members' production and transports to the final market. Depending on requirements of the final market, implementation of the strategy may require ownership of a vehicle, management of a natural forest, establishment of a wood yard, or complete vertical integration to the consumer.

The co-op will probably also want to play a role in marketing the other products of the members such as fodder or vegetables.

4.4.4 Incentives

Private pole plantations are becoming increasingly popular because of the very high returns that can be obtained from pole production (See case study of Angel Togo in Volume 1 of the SSRA). Mixed multistory cropping offers immediate returns as well as diversification in case of pole market instability.

Tenure policy modifications have contributed to increased establishment of private pole plantations. The flexibility to harvest when necessary is a major incentive to a private producer. Land and tree tenure is necessary for any long-term investment whose returns are not received annually, such as trees. Security of tenure also serves as an incentive to

responsibly manage the soils and vegetation as part of the farmer's responsibility.

The pole market is extremely lucrative. It will probably continue to expand as Borassus palm rails become more scarce. Eucalyptus is not as resistant to insects and fungi and has a shorter life than Borassus. The constantly-expanding population requires a constantly-expanding supply of low-cost building materials.

Multistory cropping also provides substantial revenue. Depending upon market distance and transportation, fruits, nuts and vegetables can provide a high return. High grade leguminous fodder, dried calabash gourds, spices and other lightweight, high value crops might offer an alternative for longer hauls. All of the above can be planted as understory crops below Eucalyptus.

4.4.5 Technical Interventions

In addition to the necessary pole sylvicultural practices, there are several interventions which serve to augment crop yields.

Live fence can be planted at 0.5- to 2-meter intervals and be interlaced to fill in the spaces. Live fence helps to keep livestock and trespassers out; soil compaction is reduced; some nitrogen fixation may also take place.

Hedges also act as windbreaks, provide some small poles from pollarding, can provide forage and reduce the amount of thorny branches which need to be cut for fencing.

Small nurseries of fruit, pole or hedge species have been established for additional income in each of the countries visited in the SSRA.

Where animals are stabled and fed cut forage, farmers have established compost pits to provide fertilizer and soil organic amendments. Farmers of bottomlands have the water needed to make composting a success.

4.4.6 Training

Farmers will be trained in intensive multistory culture. Extension agents will be trained in extension techniques and intensive multistory agricultural techniques.

As in the case of OHV, cooperative leaders will be trained in group organization, marketing and accounting.

4.4.7 Organization

A common property management agreement will be necessarily negotiated between farmers, co-op, forest service and other users of common lands.

Guards will be provided by the co-op as long as necessary for hedge and field tree establishment. Guard service will be continued if pole theft becomes a problem. These

services will be paid from the profits from the sale of grain, forage and poles.

4.4.8 Institutional Issues

The extension could be carried out by the Water and Forest Service, Agriculture, Livestock, any of the "Operations" or by the cooperative itself, if it is able to obtain the services of trained agents (through the Technical Services or NGOs). Unlike most of the other strategies, the area to be serviced in the bottomlands strategy is small enough that the size of the extension service need not be great.

4.4.9 Policy Issues

The freedom to plant and harvest, the freedom to reclaim degraded land without excessive fallow tax, the freedom to transport the harvested wood, the ability to administer permit fees for wood transport to market by the co-op, or by private clients of the co-op, have all contributed to farmers making investments in land and soil.

The rules for cross compliance by the farmers need to be established to ensure the continuation of natural resource management interventions. These rules include the loss of benefits under the LMS for those not following the management plans.

4.5 The Woodland Strategy

4.5.1 Introduction

The woodland management strategy concentrates on wooded areas rather than open cropland. It may also contain an integrated sylvo-pastoral component for manure production, improved fodder production and animal confinement and fattening. This component would be appropriate under a management plan for natural forests or for local management of village lands ("terroir villageois"). In Mali, woodlands are all administered by the Forest Service. Woodlands make up about 35,500,000 hectares. They are divided into classified national forests (1,130,700 hectares); some park and animal reserve lands; and protected lands.

4.5.2 Time Horizon/Milestones

Immediate returns are available from cutting of over-mature stems of indigenous species in natural stands. Some hay may be available in the first year with increasing production as the restoration work comes on-line. Yields should increase as there is a gradual, long-term build up of the resource base (See Annex 6).

4.5.3 Economic Engine

The returns are produced by placing the woodlands under management and making a coppice cut for wood products. Additional income can be realized from the cutting of hay and from grazing contracts granted by the cooperative management to transhumants and/or commercial herders.

The cutting of wood will increase the growth and production of the stand as the new coppice growth occurs immediately from the old stumps. Annual growth rates can increase from less than 1 cubic meter per hectare to 1.5 - 2 cubic meters per hectare just from the harvest (Guesselbodi).

Systems of rotating pasture reserves would be established and minimal soils and water conservation techniques initiated, in order to increase yields of forage grasses, shrubs and trees.

4.5.4 Incentives

Income from wood, forage, permits, contracts, decentralized control of land management decisions, permanence and stability of resource tenure are part of the incentives package. Distribution of returns would differ depending on whether the forest was classified as national forest or not.

4.5.5 Technical Interventions

Technical interventions employed in this strategy include:

1) restoration using contour ridging and stand enrichment (Farakou forest);

2) tree planting for poles and fuelwood (Guesselbodi, Niger);

3) Pennisetum and Andropogon planting for hay production (Guesselbodi, Niger); and

4) contract grazing and early season burning (Dinderesso, Burkina Faso).

4.5.6 Training

Training of trainers could be done at Guesselbodi, Niger with subsequent training of extension agents within Mali. As a number of the field operations are virtually identical to those of the sub-humid strategy, all of the agents could be trained as a group. Cooperative leaders would also receive training from a field trip to a functioning woodcutters association in Niger.

4.5.7 Organization

The strategy is based on a cooperative of woodcutters (Guesselbodi model) obtaining group loans to undertake land reclamation and improved forest management. CLUSA and Peace Corps assistance could assist in local association in learning the required management/accounting and forest management skills.

4.5.8 Institutionalization

Extension can be carried out by the Forest Service or by the cooperative itself as in the bottomland strategy, if the cooperative is able to obtain the services of trained agents (through the line technical services or NGOs). The area to be serviced by the strategy is extensive. A training of trainers approach and use of agents from other areas with more advanced experience will permit adequate coverage.

4.5.9 Policy Issues

Several policy issues will have to be addressed to allow for local management of forest resources. Local easement of certain sections of the forestry code as well as compliance to a forest management plan by the cooperative are part of this component. The donor or implementing agency will play an important role in supporting the negotiation of the easements and the cross-compliance plans.

4.6 Research

4.6.1. The Mali Long-Term Research Strategy

The GRM, with the support of USAID, the World Bank and ISNAR has initiated a long-term research strategy planning process. Five working groups have been established:

- o Rain-fed Agriculture;
- o Irrigated Agriculture;
- o Livestock Production;
- o Environment;
- o Production Systems.

These groups contain both development practitioners and researchers. Working group papers were due at the end of November 1988. A synthesis of the papers will be used to begin a review of programming processes, structure and management of agricultural research. The current terms of reference and report outlines of the working groups reflect an attempt to capture the current status of agricultural production in the country and to identify constraints which need to be addressed by reoriented programs and modifications of research administration. The intent of the process is to outline the steps needed to improve research management and to focus research on applied problems. It will begin a process that is worthy of continued support.

At the same time, the SSRA and the Action Program teams have found that researchers have not been able to consolidate the research information base that exists in Mali or has been generated in neighboring countries with similar agroecological conditions

and production systems. Examples include the species composition and regeneration potential research of Hierneau under ORSTOM and ILCA support; the earlier ILCA research on range species composition shifts and carrying capacity; the Dutch-supported work on Sahelian range productivity, ecosystem modeling and production limitations; and dryland agrometeorology, crop adaptation and field tree effects on soil fertility and soil moisture balance done in neighboring Senegal. While individuals know of this research, it does not appear to be integrated into research program and project design. A sustained effort to gather and consolidate this information would be of substantial value to the long-term strategy effort and specific research programs. As a start, experts should organize existing data and determine whether the findings are ready for test zone adaptation and application.

The creation of a unified National Research Institute may provide the opportunity to centralize research findings within a unit devoted to Desertification Research, as called for in the PNLCD. Decisions on the value of this approach should await the 1989 results of the ongoing long-term research planning process, because documentation and research information management will be an integral part of improvement of the research process. The long-term research strategy may conclude that while a programmatic focus on anti-desertification is justified, it may make more sense to concentrate research funding on existing or reshaped disciplinary units within the proposed national institute rather than create a new, specialized unit.

4.6.2 Research Opportunities

The SSRA has shown that there are a range of available technologies which may be immediately extended to farmers and herders through USAID-sponsored activities in the IInd and Vth Regions. The PIRT inventory provides an invaluable set of baseline data against which future research and development activities in natural resources management can be evaluated. Existing natural resources management techniques should be:

a) complemented by further diagnostic research to identify appropriate interventions; and

b) evaluated by a program of applied in-field research, either in the test zones or in other sites of ongoing activity, to refine the techniques.

4.6.3 Priority Diagnostic Studies

Top priority should be given to a updated estimate of forest cover by types of forests and by agroecological zone, because of the lack of analysis of the extent and condition of forests in Mali, both inside and out of forest reserve areas (forets classes). The Action Program team was unable to establish a reliable figure for forested area in the country. The first step in such a diagnosis would be to work from existing PIRT data from 1983/84 to estimate forest cover. This would provide a baseline against which to evaluate changes in cover and condition at five year intervals--a reasonable period to even out yearly swings in weather and to pick up trends in vegetative condition as well as surface area. The data is available in the PIRT tapes, but it is not digitized. If digitization is found to be too

costly, planometric studies could be done by a Malian firm. Subsequent costs would be the purchase, analysis and interpretation of satellite imagery every five years (the first in 1990), with field visits for ground truth verification.

4.6.4 Applied Research

Significant applied research opportunities consistent with GRM priorities include: soil fertility through improved agroforestry systems and manure management; the interaction of soil fertility amendment and soil moisture management; improved soil and water conservation technologies; improved natural vegetation (including fodder, ligneous, and pharmaceutical species) management; river basin dynamics, especially the management of the flood regime of the Inland Delta to maximize productivity; and riverine fish biology and ecology.

The SSRA did not capture all available technologies and delivery systems, especially those concerning fishing and livestock. Further, significant previous research has not been synthesized in a form convenient for project design or implementation. Further, SSRA-type activities in pastoral and fishing zones, research synthesis and data base development activities are needed both now and for the long run. The ISNAR group should be encouraged to help IER, INRZFH and the Institut du Sahel-Hydrobiologie (ISH) integrate agroforestry and crop research and pastoral and agricultural research into their long-term strategies.

Research is also urgently needed in the social sciences. Priority themes include issues of actual non-agricultural resource management techniques, as well as those related to technology adaptation and dissemination. Further, research on each of the three priority policy issues is necessary: resource tenure, resource management rights and market and pricing dimensions of resource use.

In the medium term, the DRSPR and the LSP II project are actively engaged in fodder and agro-pastoral research in Mali. The ARS project offers a future new vehicle for research on natural resources management. Concerning fisheries, the new ACDI "Amenagement des Terroirs" Project in four arrondissements of Segou should provide useful information to add to that collected by the IUCN in Yuvarou on opportunities to implement local management plans. The World Bank forestry project, the FAO Tropical Forestry Action Plan and the Swiss forestry project in Sikasso should yield new information about the comportment of indigenous species in the medium term.

The long lead times for research need not preclude the deployment of available techniques. Results will be equally useful when and if existing measures have been widely adopted and the climate for further innovation is enhanced.

4.7 Policy Dialogue

The GRM is currently working on changes in its forest, pastoral, domainial (i.e., urban) and rural codes. Key elements of policy dialogue crosscut these various legislative initiatives. They include tenure issues, price, tax and fine policies. The ongoing

reorientation and redrafting of key policy legislation provides a critical opportunity for AID to engage in fruitful natural resources management policy dialogue consistent with other CDSS policy goals.

4.7.1 Resource Tenure Issues

Traditionally, a range of tenure regimes existed in Mali whose degree of complexity was tied to the richness and multiplicity of potential uses of the resource in question. Distinctions between access rights accorded insiders and outsiders were imposed and, in the case of valued resources, a range of sanctions existed to police abusive use. Both complex juridical relations, such as the Fulani Dina in the inner delta, and ad hoc amicable agreements involving compensation in kind or cash existed and contributed to an ecological equilibrium.

The state now maintains its unique right to define and enforce rules governing the use of natural resources in the public domain, which comprises virtually the entire country. Some legislation, such as Mali Law 22 (1959), has simply suppressed existing resource management authority, such as the Fulani Dina of Cheick Amadou in the Delta. In other cases, the Forestry Service simply denies the existence of local authorities e.g., the water masters ("maitres d'eau") among Delta fisherfolk (Bozo, Somona). But in point of fact, given Mali's vast territories, modified traditional management systems remain in force even if, in fact, they are illegal. Given the degradation of the resource base and the shadowy overlap of modern and traditional law, what exists is a situation in which all too frequent arbitrary enforcement of law breaks has failed to prevent resource abuse. It does not produce incentives for better management. Consequently, many resources are being spent in the attempt to protect trees and soil from farmers and herder abuse, but degradation continues. The Action Program suggests a strategy to invest in a management where farmers and herders are considered as partner custodians of the resource base, as well as benefitting from its use.

Two critical problem areas are the fining system for land use violations and the bush fires policy.

Fining. Rural people often complain that fining policies, whether for forestry or fishing, bear little relation to their actual use of surrounding land or fisheries and they, therefore, see little reason to modify their behavior. Their complaints may be justified, particularly since incentive measures for water and forestry service agents are tied to their gross receipts from fines rather than to the justice of those fines. Until 1987, when a new forestry code was enacted, individual bonus payments were calculated as a flat percentage of the total amount of fines collected by each agent in the preceding month. This perverse arrangement has been only partly rectified under the new code, which provides for a uniform monthly bonus for all agents assigned to a canton ("cercle"). The bonus is still based on gross collective receipts from fines, however. Incentives have not changed for upper level administrators of the forestry service. From the canton to the national headquarters, they continue to receive bonuses based on receipts. Clearly, there is still a strong institutional incentive at all levels to maintain and increase receipts.

Bush Fires. Another focus of conflict is the use of dry season fire to clear land, flush game, renew pastures, or fulfill cultural obligations. Bush fires were declared illegal by Presidential decree in the early 1980's, and are the cause for heavy fines (see above). However, controlled burning is the most efficient way for farmers in the south to clear land, incorporate organic matter from tall weedy grasses and reduce soil acidity. Fire also helps provoke new grass regrowth early in the dry season and manage the "bourgoutieres" (Echinochloa stagina stands) in the Delta. The problem is in controlling fires. The solution lies in developing effective fire management techniques for the southern areas and alternative techniques of pasture management in the pastoral zone. Unfortunately, foresters have no latitude in sanctioning fires whatever their origin or intent. They frequently fine innocent parties (not always intentionally). Such incidents exacerbate poor relations between foresters and rural dwellers.

Political Risks. Resistance to change is in part due to a variety of political risks (and, as noted, existing economic interests), some more imagined than real. Decentralization may be viewed by the State as the prelude to the emergence of separatist political tendencies which the State regards as intolerable.

Powerful private interests may contribute to the political risks of resource tenure reform. This has become a problem with the transfer of ownership of a portion of the national herd from the hands of traditional herders into the hands of powerful absentee owners.

Decision-makers also fear the social and political problems that may occur when user rights are granted to one set of people and not to another.

4.7.2 Recommendations

The Action Program team was asked by USAID/Mali to examine the natural resources management strategies and policy options available to the GRM if no new external resources were available to it. The conclusion of the team was that if existing programs and projects from several major donors and much of the ONG community were focused on integration of their agricultural and natural resources activities, along the lines of the LMS's described earlier in this chapter, that convincing demonstration of the benefits of policy change could be made to the GRM. However, the GRM would then be faced with the need to perform a triage of areas in the country to concentrate staff and operating budgets in areas where the new policies could be implemented, reducing staff and operating budgets in other areas. In effect, donors would be asking the GRM to undertake an adjustment as important for long-term sustainability of its agricultural production as the on-going pricing and economic policy structural adjustment activity. Whether the GRM can undertake this adjustment without greater external financial assistance was beyond the scope and the capacity of the Action Program team. It is a worthy point for future PNLCD fora.

Overall, donors should follow a two-tier strategy in promoting changes in GRM policy. One element is policy dialogue to change resource management codes. The other is to pursue ad hoc or negotiated change locally.

4.7.2.1 The Importance of Sustained Field Initiatives

SSRA results indicate that the Mission should not wait for statutory change to start programs. Field actions and ad hoc tenure modifications have led to statutory changes. Only two unequivocal statutory changes were observed in the seventy initiatives studied in the SSRA and both occurred some time after projects were initiated (FLUP, 8 years; Majjia Valley Windbreaks, 14 years).

Establishment of model sites (such as the 6 test zones in Mali) is one way to build consensus about the benefits of use rights linked to management plans. Statutory changes may not occur for many years after establishment of such sites. But such long-time horizons may be required to sufficiently diminish risks to the point where consensus develops.

4.7.2.2 Linking Change to a Management Plan

Having secure rights to natural resources is not an assurance that medium- and long-term investments will be made. If tenure security is provided, adherence by participants to negotiated co-management plans are also necessary to control abuses in the short-term i.e., until participants begin to realize increased benefit streams from improved natural resources management strategies. If the party granted tenure security does not comply with jointly-developed co-management plans, the ultimate penalty should be loss of tenure security. It is the responsibility of donors and the GRM to develop acceptable, site-specific, co-management plans. (Specific details of appropriate plans can be developed from the IUCN-Youvarou, FAO-Banamba, Kaarta-CECI-ODIK, and USAID-Guesselbodi experiences.) Financial risk sharing should be a foundation of such plans. The payoff for compliance should include improved resource availability and increased participation in the (multiple) benefits of use. Granting user rights for very specific cases and imposing cross compliance to a management plan is one way to limit the perceived risks of political or socioeconomic conflict.

4.7.3 Recommendations on Policy Issues for USAID/Mali

On a project-specific basis, USAID policy dialogue should target the following issues:

4.7.3.1 General Resource Policy

a) Development of a set of regional rural codes for application in the context of local management plans;

b) Tropical Forestry Action Plan (TFAP);

c) Decentralization of land use planning, natural resources project execution, financing and evaluation;

d) Local negotiation of land use regulations.

4.7.3.2 Haute Vallee Project

Establish simple procedures for allocating usufructuary and ownership rights over natural resources in most advanced sectors. Obviously, arriving at such procedures will not be simple, but will be a negotiated outcome between technical services, funding sources and local participants.

4.7.3.3 Village Reforestation Project

In the short- to medium-term:

a) support implementation of recommendations in the Swiss-financed study of the forestry police concerning use permits, standards for species protection, and amounts of fines;

b) support for establishment of model sites where changes in text, application and resource tenure rules may be tested;

c) experimentation with village fire brigades on the Swiss model tested in Sikasso.

In the long run:

a) support for a long-term GRM program to rewrite the rural code;

b) curricula reform at IPR and DFPF to facilitate popular forestry and the role of extension agents;

c) guaranteeing benefits to investors in natural resources management improvements;

d) use of controlled early burning for low cost forestry management purposes;

e) re-establishing effective traditional systems of natural resources management within an overall legislative framework.

4.7.3.4 Livestock Support Project II

Suggestions include:

a) establishment of pilot zones for transit corridors and pasture perimeters (ceinture de paturage), adding local input on management and access conditions;

b) simplification of offtake procedures and diminution of livestock export taxes;

c) review of animal products price and quality control standards for Bamako

market;

d) use current good entree at cabinet level to clarify objectives, responsibilities and authority of institutions involved in the livestock sector;

e) pursue ongoing reform of credit policy;

f) use current good entree at cabinet level to contribute to ongoing intra-ministerial dialogue on the pastoral code (1990-1995).

4.7.3.5 Economics and Policy Reform Project II

Support should be given to the following price and taxation policy changes:

a) Use of energy prices, point of production and incentive-based licensing systems for use as alternatives to taxes and fines in promoting improved resource management;

b) Support liberalization of seedling pricing policy;

c) Promote commercialization of improved stoves;

d) Support privatization of natural resources management e.g., contract reforestation to local units of territorial administration;

e) Provide the Forest Service with opportunities to recoup lost income from fines for the National Forestry Fund, initially in site-specific cases;

f) Review the permit cost structure in developing co-managed woodlots on the Guesselbodi, Niger model with set-asides for the National Forestry Fund;

g) Support recurrent cost reduction through increased user fees and local, financially self-sufficient, natural resources management activities.

If USAID believes that the EPRP program cannot sustain the added management and monitoring burden of these policy issues, then it should pursue them in coordination with other donors. The upcoming IBRD environmental loan may be an appropriate vehicle for this type of donor coordination around a specific grant or loan.

4.8 Donor Coordination

Two key areas are central to donor coordination for natural resources management purposes--policy dialogue to encourage institutional and legislative reform and support to the test zones of the PNLCD. Natural resources management policy is in a tremendous state of flux. Donors have been able to negotiate what are essentially policy easements for their areas of project intervention. Donors are also supporting major revision of the fundamental legislation affecting land tenure and use of forests, grazing lands and fisheries.

The GRM has accommodated these changes and the studies of code revisions. Implementation of code revisions has proven to be more difficult because of ingrained institutional incentives for the maintenance of existing codes and their administration. Chief among these is the revenue that code enforcement provides both the national Forestry Fund and the local forest agents. Coordinated donor effort is now needed to reinforce the political will of the GRM with testing and implementation of policy changes to move from an unbalanced enforcement approach to a user fee and sustained use approach to code development and administrative implementation. To date, the efficacy of donor coordination has been hampered by: 1) the sensitivity of the Forest Service to reform through donor coordination; and 2) the checkered pattern of commitment among donors to actively seeking reform.

Participation in the PAFT, an FAO program coordinated in Mali through the DNEF with FAC assistance, may become a powerful tool through which to concentrate donor pressure for serious efforts at institutional and legislative reform of the Forest Service and Forest Code, respectively.

The second major area for donor coordination should be the joint monitoring and review of the test zone component of the PNLCD. Donors are taking different approaches to the test zones ranging from a slow experimental process (the World Bank) to modification of existing programs (the approach recommended here) to more direct intervention (the PRC). As the test zones are intended to develop models of broader application, donor roundtables with the GRM should continue to be regular affairs examining both technical approaches and the implications of the results of test zone work for further donor assistance.

Details on ongoing activities of other donors are contained in the FSDP (688-0235) Project Paper and the SSRA reports. Only PRC, RFA and Canada, among major bilateral donors, are contemplating new projects with a NRM focus. Among the multilateral aid organizations, the FAO is prospecting for new project activities as well.

4.9 Monitoring and Modifying the Program

The Action Program described above builds on a base of accumulated positive experience in natural resources management. The limitations of the program in terms of its coverage of natural resources result from the lack of examples of sustained success in the management of grazing lands and the SSRA's concentration on land-based activities.

The GRM and donors have made substantial investments in the livestock sector. There is an evolution within the livestock services towards a better balance of effort between animal health and animal production, privatization and cost recovery from animal health services and sedentarization of livestock through integration in farming systems. The livestock, range and use conflict issues are important ones and have been the subject of extensive study. Projects are grappling with these issues and testing interventions in pastoral systems. These experiences need to be monitored over time and an evaluation made of promising interventions done, preferably after the veterinary and marketing

privatization efforts underway have begun to be consolidated. Fisheries is another area where the production environment and organization of the industry has been changing rapidly.

The basic recommendation in these topical areas is that, in Mali, the search for succesful interventions is still underway. Reinforcement of field studies to generate primary data and applied research is needed to develop action program strategies in areas where livestock or fisheries are a dominant economic activity.

The underlying principal of the action program is that it is based on increments to existing practices which promise sustained returns from local investment. As new techniques or organizational practices prove themselves, they should be added to the action program. In practice, the identification of successful techniques will take place as projects are implemented and applied research tests new ideas off the research stations. Perhaps the best way to institutionalize the monitoring and adjustment process is to train technicians and managers at several levels in natural resources management approaches. Over the near term, this effort will need to be seconded by monitoring of the PNLCD program overall which will be done by some national structure within the Ministry of Environment and Natural Resources, perhaps the National Center for Anti-Desertification Studies proposed by the PNLCD. The less formal fora of GRM and donor roundtables is a less-costly option for monitoring and adjustment of this and other donor strategies.

ANNEX 3
SUB-HUMID ZONE STRATEGY

3.1 LOTUS SPREAD SHEET

3.2 Sub-humid Strategy Assumptions

Year	Crop	%	Yield	Crop	%	Yield	Kg ha/yr	cfa /ha/yr
1	Cotton	100%	600		0%	0	600	51000
2	Sorghum	50%	250	Maize	50%	400	650	10275
3	Peanuts	50%	200	Niebe	50%	150	350	12575
4	Cotton	100%	600		0%	0	600	51000
5	Sorghum	50%	250	Maize	50%	400	650	10275
6	Peanuts	50%	200	Niebe	50%	150	350	12575
7	Cotton	100%	600		0%	0	600	51000
8	Sorghum	50%	250	Maize	50%	400	650	10275
9	Peanuts	50%	200	Niebe	50%	150	350	12575
10	Cotton	100%	600		0%	0	600	51000
11	Sorghum	50%	250	Maize	50%	400	650	10275
12	Peanuts	50%	200	Niebe	50%	150	350	12575
13	Cotton	100%	600		0%	0	600	51000
14	Sorghum	50%	250	Maize	50%	400	650	10275
15	Peanuts	50%	200	Niebe	50%	150	350	12575
16	Cotton	100%	600		0%	0	600	51000
17	Sorghum	50%	250	Maize	50%	400	650	10275
18	Peanuts	50%	200	Niebe	50%	150	350	12575
19	Cotton	100%	600		0%	0	600	51000
20	Sorghum	50%	250	Maize	50%	400	650	10275
							543	25219

ANNEX 4
SEMI-ARID ZONE STRATEGY

4.1 LOTUS SPREADSHEET

4.2 Semi-Arid Strategy

Year	Crop Associations Crop	%	Yiel	Crop	%	Yield	Kg ha/yr	cfa ha/yr
1	Millet	80%	480	Niebe	20%	120	600	14904
2	Millet	80%	480	Niebe	20%	120	600	14904
3	Millet	80%	480	Niebe	20%	120	600	14904
4	Millet	80%	480	Niebe	20%	120	600	14904
5	Millet	80%	480	Niebe	20%	120	600	14904
6	Millet	80%	480	Niebe	20%	120	600	14904
7	Millet	80%	480	Niebe	20%	120	600	14904
8	Millet	80%	480	Niebe	20%	120	600	14904
9	Millet	80%	480	Niebe	20%	120	600	14904
10	Millet	80%	480	Niebe	20%	120	600	14904
11	Millet	80%	480	Niebe	20%	120	600	14904
12	Millet	80%	480	Niebe	20%	120	600	14904
13	Millet	80%	480	Niebe	20%	120	600	14904
14	Millet	80%	480	Niebe	20%	120	600	14904
15	Millet	80%	480	Niebe	20%	120	600	14904
16	Millet	80%	480	Niebe	20%	120	600	14904
17	Millet	80%	480	Niebe	20%	120	600	14904
18	Millet	80%	480	Niebe	20%	120	600	14904
19	Millet	80%	480	Niebe	20%	120	600	14904
20	Millet	80%	480	Niebe	20%	120	600	14904
							600	14904

ANNEX 5
BOTTOMLAND STRATEGY

5.1 LOTUS SPREADSHEET

5.2 Bottomland Strategy Assumptions

Year	Crop Associations Crop	%	Yield	Kg ha/yr	cfa ha/yr
1	Garden	100%	2000	2000	200000
2	Garden	100%	2000	2000	200000
3	Garden	100%	2000	2000	200000
4	Garden	100%	2000	2000	200000
5	Garden	100%	2000	2000	200000
6	Garden	100%	2000	2000	200000
7	Garden	100%	2000	2000	200000
8	Garden	100%	2000	2000	200000
9	Garden	100%	2000	2000	200000
10	Garden	100%	2000	2000	200000
11	Garden	100%	2000	2000	200000
12	Garden	100%	2000	2000	200000
13	Garden	100%	2000	2000	200000
14	Garden	100%	2000	2000	200000
15	Garden	100%	2000	2000	200000
16	Garden	100%	2000	2000	200000
17	Garden	100%	2000	2000	200000
18	Garden	100%	2000	2000	200000
19	Garden	100%	2000	2000	200000
20	Garden	100%	2000	2000	200000
				2000	200000

5.3 POLE PRICES

Mopti, Mali April 1988
Mana Diakite, E. Karch

$=cfa 300

pieces	Meters center diameter	Meters length	cfa each	M3	CFA/M3	$/M3	/M3
poles	0.0425	2.0	75	0.0028	26447	$88.16	353
	0.0450	2.0	75	0.0032	23590	$78.63	315
	0.0500	2.0	75	0.0039	19108	$63.69	255
	0.0525	1.8	1000	0.0039	256767	$855.89	257
	0.0525	2.2	1000	0.0048	210082	$700.27	210
	0.0600	2.0	1000	0.0057	176929	$589.76	177
	0.0800	1.9	1000	0.0095	104760	$349.20	105
forks	0.0600	2.5	750	0.0071	106157	$353.86	142
	0.0650	2.5	750	0.0083	90453	$301.51	121
	0.0650	2.5	750	0.0083	90453	$301.51	121
	0.0650	3.0	750	0.0099	75378	$251.26	101
	0.0650	3.0	750	0.0099	75378	$251.26	101
	0.0850	3.0	750	0.0170	44079	$146.93	59
beams	0.0900	5.0	1250	0.0318	39317	$131.06	31
	0.1100	5.0	1250	0.0475	26320	$87.73	21
	0.1400	5.0	1500	0.0769	19498	$64.99	13
	0.1600	5.0	1500	0.1005	14928	$49.76	10

ANNEX 6
WOODLANDS STRATEGY

6.1 LOTUS SPREAD SHEET

ANNEX 7
SITUATION UPDATE: THE RURAL CODE AND RELATED PASTORAL AND FORESTRY CODES

7.1 Background

A variety of commissions are at work on revising the pastoral, forestry and fisheries code, as well as the urban codes. The Ministry is still digesting the report of the Joint Commission on the Forest Police submitted in May 1987. It has also drafted a plan to make a detailed nationwide study of modern and customary law regulating natural resources use. It proposes to submit a draft code for legislative approval in late 1992. As conceived in the planning document, on-the-ground implementation is not expected before 1993! Finally, these questions--the forest police and rural code, among others--will be explored through the TFAP. Coordinated by MM. Moustaph Soumare, Technical Counselor to the Minister of Environment and Livestock, Jean Gadant (FAO) and Jean-Francois Leenhardt, Technical Counselor to the National Direction of Water and Forest Service, the PAFT convenes its first plenary session in January 1989 in the aftermath of a number of FAO and FAC-sponsored missions which began in 1987.

Some of the Malien officials interviewed believe that there is the need to write a general rural code which establishes land tenure and use principles and the regulations governing protection and exploitation of the natural resources base in all domains. Further, they express the need for a mechanism which explicity incorporates means to adjust the code to meet the local resource conservation and management needs. Adjustments would permit variations in policies such as the current total ban on fires to include the possibility of prescribed early burning where appropriate. As a first step, project areas might be given the latitude to experiment with different use rights, leases, joint management contracts and the like to determine if the changes lead to improved resource management. In this case, donors would support some of the work leading to code revision and make up any short-term reduction in tax and fine receipts due to new practices. To be sustainable, of course, rent, user fees, access licenses and permits, sales taxes, lease payments or other mechanisms would have to replace the current set of often arbitrarily imposed fines and penalties.

The Water and Forest service is very sensitive to the public perception that it is a repressive organization which is blocking rational preservation and use of the natural resources base. Its leadership rightfully points out that the State must retain the ability to sanction actions which destroy natural resources. At the same time, the Water and Forest Service leadership admits that the Service has, through its field agents, arbitrarily and wrongfully imposed penalties on many occasions and often failed to follow-through on enforcement of use and conservation provisions within the larger forest concessions granted. For example, only some 15 percent of commercial uses are, in fact, taxed. It also accepts the fact that adjustments in the bonus system have not reduced the incentive for field agents to maximize their fine collection.

At the same time, Water and Forest Service leadership and personnel cannot accept broad policy and enforcement administration changes without being assured that revenues to the Forestry Fund will be maintained at least at current levels; that any new policy put in place will, at a minimum, not lead to more rapid degradation than now occurs; and, that

the implications of the changes for the organization and compensation of the staff of the Service are generally positive and supportive of a greater service and extension orientation. The following sections describe the type of detailed debate which examination of the existing code evokes.

7.2 The Statist Position

There are two types of land in Mali. One is occupied by forest reserves and the national parks. These are under the complete control of the State. All other lands outside of the towns are also owned by the state. But these lands are used by the people of Mali; as such they are a common property resource which is, in theory, protected by the State. The Water and Forest Service protects these lands from overuse and destruction. In no country of the world is the maintenance of State-owned land left in the hands of private individuals or communities. If the enforcement provisions of the code forestier, code de peche or code pastoral were lifted, the land and water resources of the country would be destroyed. It is true that there are some agents who abuse their power. It is only human that when staff are not payed on time or not paid sufficient salaries that they may overstep the spirit of the law while adhering to the letter. But, outsiders should not say the the Water and Forest service is repressive. Staff of the service are patriots and are striving to maintain the resource base in the face of tremendous pressure from the drought, the growing population and self-serving behaviors which destroy natural resources. If it was true in the past that the Water and Forest Service was repressive, one has to realize that the code forestier and the police-like activities of the forest agents is inherited from the code, training and institutional organization of the service which was heavily influenced by the colonial administration. Both the code and its application have been evolving over time. The Service is willing to experiment in well defined areas with other approaches, but the donors must be willing to underwrite these changes and demonstrate that their effects will be better than current practice. If the Water and Forest Service drops its enforcement measures, the environment will be devastated. Only 25 percent of the Fonds Forestier comes from fines and user fees; the rest comes from donors and from the national budget. So donors should not think that changing the forest code is going to change the way the forest service operates.

7.3 A User-Oriented Perspective

The code is one which penalizes people whose land or trees shows evidence of abuse. It is not always clear that agents attempt to determine who is to blame for observed damage. Arbitrarily fining all whose land or tree resource shows damage is responsible, in large measure, for the poor reputation, even within the Ministry of the Environment and Livestock Husbandry. It is curious that even while forest service agents are fining villagers, the forest service seldom, if ever, monitors the extraction of wood products from forest concessions granted in the forest reserves. (No explanation is offered). At the same time, it has to be admitted that there are no institutional incentives at the moment for Forest Agents to act differently.

As one agent explained: "A forest agent who spends all day in the village promoting the planting of trees and the use of improved stoves will return to his home with empty pockets. His colleagues, who have been out fining farmers, will call to him as they go out for the evening, asking him to come along. He will hang his head in shame, as he has no

money to go with them. His wife will ask how they are to live without money. His salary will not have come for three months. When it shows up, it will be for only one of the three months due."

The management of the Fonds Forestier has changed to spread the money received in fines and in user fees to agents at the field level as well as at the center. However, there is still a big incentive (15%) of collected fines for agents to engage in police activities rather than forestry and resource management activities. The service cannot reduce its personnel, because it has to cover the entire country.

The code needs to be changed, but so do the working conditions and the incentives extended to the individual forest agents. Further splitting of fines among a larger number of forest agents will do little to solve the basic problem of an incentive system which rewards police behavior. Projects which pay the same salary to an agent as agents receive in regular service do not solve the problem. There is no incentive for an agent to work harder in a project through which he has been relieved of enforcement responsiblity than he did when he worked with the regular forest service.

There needs to be a new code. One which recognizes individual rights to land and the products from that land. What is needed is a broad code which can be applied nationally but modified to meet local circumstances in areas where forestry, fisheries, or pastoralism dominates. Such a code would be analogous to zoning laws in the United States which have to be as stringent as Federal NEPA law requires but are as locally elaborated and enforced. Accompanying this code would be major changes in the structure and operating procedures of the forestry service.

7.4 A Conflict Resolution View

The question is: If the police element of the forest service were eliminated, would the environment be destroyed or preserved? If local control of resources were possible, then there would probably be good use of the resource base and protection of its productive capacity. Further, point of production taxation of commercial users by local management committees so empowered, should increase the percentage of taxation of commercial operations. In addition, development of locally-managed tourist facilities ("villages touristiques", artisans groups, etc.) could lead to a reduction of poaching and encroachment on Mali's devastated national parks.

Continued, uncontrolled use of natural resources by "outsiders" would probably lead to limited cases of devastation (at least) if they, the outsiders could lay claim to the use of local tree and pasture resources. Thus, there is a role for the forest service to play in enforcement. But, enforcement needs to be directed primarily towards ensuring adherence to use agreements where all parties know how the resource is to be valued and the rules of access and use.

Jean Gadant, responsible for the Tropical Forests Action Plan in Mali suggests that it might make more sense, given the Forest Service's limited resources, for agents to concentrate on narrowly defined forestry per se and leave local forest management and extension activities to the ORD's and other project supported activities.

7.5 Recent legislation

Recent legislative initiatives include:

- the law of 21 March 1986 making use of improved stoves mandatory;
- the law of 24 March 1986 modifying the forestry code;
- the law of 26 July 1986 placing a tax on land clearing (fallows of more than five years);
- the law of 26 July 1986 outlawing bush fires and requiring rural people to combat them;
- the law outlawing hunting (more recently reversed?).

ANNEX 8

RECENT DONOR ASSISTANCE TO THE GRM'S ANTI-DESERTIFICATION PLAN

In 1987 and 1988, major donor assistance was used by the GRM to undertake field and prefeasiblity studies. Special efforts have been undertaken to:

1) review and start revision of the forestry, pastoral and land tenure legislation (Swiss, CCCE, FAO);

2) identify and perform pre-feasibility studies within the mosaic of test zones which will be used to develop overall technical and organizational approaches to protect and restore the natural resources base in the major agroecological zones (e.g., the Green Dam design supported by the PRC, UNSO and the Norwegians);

3) incorporate natural resources management into the programs of the production-oriented integrated rural development operations (ODR's, many donors); and

4) develop a strategy to the year 2000 for the national research system (World Bank, USAID, ISNAR).

Each of these efforts, along with individual donor projects, is increasingly being viewed by the government as supporting one or more of the eight general programs of the PNLCD.

ANNEX 9
APPROACH AND CONDITIONS FOR SUSTAINABLE DEVELOPMENT

9.1 The SSRA Perspective

The Action Program for Mali defines the conditions for sustainable development from two perspectives. They are the SSRA and the Congressionally-mandated perspectives. The SSRA looked for evidence of institutionalization of the interventions--techniques which were integrated or being folded into the behavior of resource users. The successes included both single actions--half-moon microcatchments for revegetation, for example--and combinations of technical interventions with organizational approaches to conflict resolution and local modification of the usufruct laws by the national forest service--the Guesselbodi, Niger example of degraded forest restoration, coppice management, microcatchment-based forage crop production and negotiation of access and use of forest reserve land in exchange for adherence to a well-defined management plan.

The empirical successes were analyzed financially to estimate the costs, benefits and risks to producers. Strategies were then built from menus of options identified in the SSRA combining the technical, organizational and financial approaches which appear to offer the best chances for broad local diffusion and which could, over a twenty-year period, stabilize and improve the productivity of the farm, pasture, or forest resource base in the semi-arid and sub-humid zones of the Sahel. The strategies are flexible implementation frameworks which permit variations in scale and in the selection of the precise techniques included (See chapter 4). These strategies were then presented to USAID, the GRM, other donors and the NGO community for their reaction and comments. The discussions reinforced the findings of the SSRA that understanding a set of priority conditions for sustainable development is key to the selection of activities which are capable of being absorbed by local communities over time.

Macroenvironmental perspective of the Congressionally-mandated assessment of tropical forestry (FAA 118) and biodiversity (FAA 119). This perspective drives a search for initiatives which were likely to have the greatest effect on the productivity of large environments and afford protection of the habitats holding the country's major reserves of endemic plant and animal species--the Inland Delta, Boucle de Baoule Park, Bafing Park and other preservation and conservation sites. The 118/119 assessment also used the SSRA criteria for sustainable development to screen on-going activities and proposed actions. The 118/119 Assessment is given in a separate report.

9.2 Environmental Conditions for Sustainability

The SSRA survey identified the following environmental criteria for determining if conditions for sustainability exist:

1) soil fertility is improved or further degradation halted;

2) soil humidity is increased or the quality of water available is improved;

3) vegetative cover is increased, especially with plants that help stabilize soil, improve soil fertility or enhance water capture and use;

4) the habitat supporting the endemic biodiversity of an area is improved or maintained or, if the habitat cannot be reasonably protected, that salvage collections of species be made and maintained for future use.

Guiding principles for specific selection of actions include optimizing the use of locally-available materials, local organizational forms and management skills, reducing capital outlays and reducing recurrent maintenance costs.

9.3 Semi-Arid Zone Objectives

Sustainable development will require the integration into the program of actions which combine both fertility and water enhancements, because this zone is subject to substantial swings in resource base productivity from wide rainfall fluctuations. Sustained government and donor support is required just to bring conditions up to the point where sustainable investments in regenerated productive resources themselves become possible. Principal objectives are:

- Near-term -- soil and water erosion control and improved management of organic compost and manure to increase average millet and sorghum yields increased and reduce the probability of crop failure;

- Medium-term -- soil and water conservation and field tree enrichment to increase dry-season forage and management plans for village forest lands to increase quantities of wood and other forest and horticultural products;

- Medium- to long-term -- improvement of fallows requirements should be reduced, increase in forested area and increased livestock land-carrying capacity.

9.4 Sub-Humid Zone Objectives

In Mali and throughout the Sahel, this zone includes a higher frequency of cash crops, higher existing vegetative cover, generally higher potential risk for water erosion and soil leaching and increasing integration of crop and livestock activities through animal traction. Principle NRM objectives are:

- Near-term: substantially greater use of manure and compost in combination with crop rotation, fertilizer use and soil and water erosion control to increase crop yields;

- Medium-term: increased production of wood from living hedges, field trees, windbreaks, and forest areas, greater control of run-off and erosion over subwatershed areas and more widespread improvement in the condition of animal traction animals; and,

- o Long-term: reduced pressure to clear forest lands, increased life span of crop fields, decreased risk of crop failure due to droughts and higher livestock carrying capacities.

9.5 Institutional Development Issues

The SSRA presents cases of many initiatives which have worked locally, where donors or ONG's have concentrated resources and made substantial time commitments to programs. In some cases the initiatives have spread over time to larger areas e.g., the Majjia wind breaks in Niger, improved cookstoves in Mali. The major institutional challenge for the Action Program is the identification of the broader implementation vehicles for widespread diffusion of the LMS's which can be maintained with low or no investment external to the country. The public sector does not have the institutional capacity to implement resource protection measures on a scale sufficient to have a major impact on the Sahelian environment. The findings of the SSRA show that increased local management responsibility can improve natural resources management. The Malian government has made public statements calling for increased popular participation in development activities and decentralization of decision-making authority to local levels. Progress towards achieving the twin long-term institutional goals of decentralized and sustained natural resources management is discussed below.

9.5.1 Decentralization of Authority

While the state will always play the key role in determining the management policies and enforcement of common property use, the most viable level for autonomous public management is, in most cases, the historical seat of social cooperation. Key resource managers include the household, the lineage, ton (age group), village groups (including fishing communities united behind the "water masters" [maitres d'eaux]), herder fraction or, possibly, the multi-ethnic canton. In some areas the producer cooperatives and, in selected cases, the organs of the political party (UDPM), now incarnate certain features of the traditional resource management institutions. Given their dominance of local public investment, other formal institutions which must be included in any outside intervention in resource management are the Local Development Committees (CLD). Further, sustainability of NRMS interventions will depend upon obtaining the official sanction, support and, in some cases, enforcement by canton, arrondissement, and/or cercle units of government services and territorial administration (See Figure 9.3.1).

The most practical means of achieving autonomous local management have been the further devolution of taxing, spending and resource management authority to the various local levels (i.e., the terroir, the village and below) in the long term (10 years). The likely target organizations are the Village Associations (Association Villagoises) (which may develop into "Tons" or formal village organizations with membership across traditional age-groups on the GRM model), CLUSA-type cooperatives and/or local sections of the political party, the UDPM.

The best local point(s) of institutional attachment for implementation of NRM strategies will vary according to the following major points:

- o Ethnicity;

- o Political Complexity;
- o Resource Concentration and Overlapping Resource Claims;
- o The Role of Women as Resource Managers;
- o Village Structure and Local History.

The SSRA showed that successful natural resources management activities were able to provide economic incentives for organization which frequently overcame the sociocultural complexity of an area.

Sustained donor support for investment in, and negotiation of, natural resources use management interventions at the level of the CLD or Cercle is the best compromise approach for the short and intermediate term (5 years). The devolution of NRM authority will be an interactive process based upon demonstrating success and asserting responsibility for resource use management. It will not be without conflict as, for example, in the revision of the Forest Code licensing, taxation and fine structure. It has been reported, for example, that only 15 percent of commercial fuelwood transactions are taxed in Mali. If an alternate system gave tax or licensing power to local village control for some forest concession areas, as has occurred in neighboring countries, overall receipts would probably go up, permitting greater allocation of fees to support local forest agent activities.

9.5.2 Training

A sustained, iterative training and skill transfer effort at the local level is a key element of improved resource management capabilities for the long run. The range of available NRM techniques inventoried by SSRA is not yet widely known by researchers, project implementors, local technicians or farmers. Similarly, the importance of an economic motor to sustained NRM success is understood by few. Consistent with the opinion of some NGOs, donors and factions in the GRM itself, successful NRM will require that the narrow sectoral focus of technical services as well as the local producers' organizations be broadened in the long term.

Support for revision of curricula and training of forestry and other technical personnel is necessary. Similarly, upgrading the technical capacity of services and local organizations is a necessary part of the institutional reforms required to implement successful resources management strategies. Basically, local technical services must be able to: a) deliver required inputs and advice on time; and b) assure regular follow-up of jointly-managed activities. Many ODRs, NGOs as well as village associations fault the technical services on this count. For their part, the services fault the donors, ODRs and NGOs for leaving them out of planning and implementation activities which would improve their technical capacity.

9.5.3 Legislative Reform

Support for reforms of the Forestry Code and a more general rural code in Mali, which provides for a transfer of management responsibility into local hands (via partnerships between government, the citizenry and aid organizations), is a necessary

component of long-term, improved resource management strategies. Vehicles for accomplishing this should include the development of model sites (e.g., the "zones-tests"), the Tropical Forestry Action Plan (TFAP) donor roundtable and sustained policy dialogue.

9.5.4 Reorienting the Field Services of the Forest Service

Donor pressure to divide the Forest Service into extension and enforcement branches on a national scale, as proposed in the FSDP (688-0235) and as experimented by the VRP and the OPRS (Swiss, Sikasso) projects, is a critical first step towards the lifting of institutional constraints to improved NRM in Mali.

9.5.5 Conflict Resolution

The successful negotiation of local land use and planning agreements is a key element for assuring long-term sustainable resource use. Realization of such agreements involves identifying resource users (villagers, herders, others) and uses, negotiating consensual agreements at the customary level among traditional authorities as well as with technical services and CDLs, formalizing these agreements at the administrative level (arrondissement, cercle, region) and, finally, providing support and incentives for enforcement. Some progress has been reported by the IUCN in Yuvarou, CECI/ODIK in the Nioro de Sahel region (notably along transhumant corridors) and the FAO project in Banamba. Monitoring of, and support for, these activities is worthwhile.

9.5.6 Choice of Institutional Development Model

Local institutional development can follow two models. One is the "amenagement de terroir villageois" (management of the village territory) model which assumes a fixed population exploiting a spatially-delimited resource base. The other is a resource-focused management model which assumes a cyclically-fluctuating resource base which serves different human purposes at different points in time. This model is appropriate for seasonal aqueous resources such as those of the delta and for transhumant pastures and corridors. Appropriate management institutions for these two situations will differ.

9.5.7 Recommendations

USAID/Mali currently supports efforts in all of these areas. What is required is an effort to systematically pursue these goals through adjustments in activities within the current portfolio and maximizing new opportunities within upcoming project activities.

In the short-term:

- Encourage the GRM to restructure the Forest Service into distinct extension and enforcement branches;
- Integrate indigenous and expatriate NGOs as well as government agencies and institutions into the execution of natural resources management initiatives;
- Monitor ongoing resource use and conflict resolution strategies;

- o Assist project-executing agencies to implement the proposed NRMS strategies through partnerships between the ODRs and/or NGOs and government technical services.

In the medium term:

- o Support revision of curricula and training of forestry and other technical personnel;

- o Upgrade technical and delivery capacities of technical services and local organizations (management information systems, cooperative training, accounting, credit management, conflict resolution, environmental education, etc);

- o Support investment, negotiation and natural resources management interventions at the level of the CLD or Cercle as the best compromise position for the intermediate term.

Over the long run:

- o Alter institutional incentives for individual and divisional performance within the Forest Service to higher sustained returns from improved resource management;

- o Through policy dialogue, support revisions of the Forestry Code and development of local land use codes which optimize local authority over resources;

- o Extend the Village Territory Management System widely through the country from the test zone examples.

9.6 Policy

9.6.1 Policy Reform Priorities

There are three recommended policy reform priorities: resource tenure, resource management rights, prices and fees.

9.6.2 In some project areas in Mali's Vth Region, USAID negotiated a suspension of fining by forestry agents in the project areas of the Village Reforestation Project. The policing role of forestry agents, often accompanied by abusive fining for their own profit, has engendered mistrust of both the agents and their messages. Removal of this role has increased villagers' receptivity to the extension services and provided a more constructive vehicle through which to obtain much needed technical support.

9.6.3 Political support and commitment have had sometimes dramatic results. The success of improved stoves in Mali occurred through four principal mechanisms:

- o years of field extension and training;

- o mobilization of local organizations;
- o national publicity campaigns; and
- o direct political mobilization through the Party, including passage of a law which requires all households to use improved stoves.

The first two mechanisms have been in place for many years. National publicity, political mobilization and passage of the law pushed the effort over the top. A similar example of large-scale participation through political mobilization is provided by the Keita project in Niger, where hundreds of farmers in the arrondissement have adopted soils and water conservation measures under the direction of an energetic and committed regional governor.

9.6.4 Conflict resolution activities undertaken by agents of the public sector will take on increasing importance in coming years, but conflict negotiation remains as yet underemphasized and underfunded. As the environmental crisis in the Sahel has worsened, so have the potential conflicts between competing interests: between farmers and agro-pastoralists, between local herders and migrants, between merchants, local groups and the state, not to mention the conflicts between agriculture and wildlife driven from their natural habitats and now threatening dwindling agricultural output. The primary lesson of the IUCN project in Youvarou is the need to work with fishermen, farmers and herders to determine sustainable and equitable means of allocating the scarce water resources and land rights in the complex ecosystems of the inner delta.

9.6.5 The single most important public policy issue is that of resource tenure. Land tenure is ill-defined in all four SSRA countries. Farmers enjoy use rights only, within the bounds of traditionally-defined land use practices governed either at the village or district levels. Legal title to the land resides in the public domain, in practice the State, and there is no formal protection to landholding. As we have seen, however, environmental crisis has created the need to invest in improvements to the land base to protect it from degradation. Insecurity of tenure reduces the incentive to make such investments. Heightened conflict for resources has further reduced the security of tenure for smallholders. Finally, as communal organization is overlaid with more impersonal structures, the system of vaguely-defined rights increasingly lends itself to abuse by those with access to the levers of authority.

9.6.6 Lack of resource tenure is a constraint to replication of successful initiatives. In interviews with farmers, field workers and project staff, the issue arose repeatedly. Some projects have obtained exemptions to land tenure and other legislation, but these remain local in their coverage and impact. Successful projects have often taken place despite the negative impacts of current laws, but even here there is clear evidence of resource tenure being a constraint to further replication. Where successful innovations have increased the perceived value of the land, it has sometimes made it more difficult for imitating farmers to gain similar land access rights.

9.6.7 As potential conflicts for natural resources become more acute, resource tenure is likely to take on increasing importance as a constraint to the massive popular participation

that will be required to stabilize the Sahelian environment. A number of specific issues will also have particular localized importance, and will require local solutions which even a reform of national legislation will be insufficient to address. Foremost among these are the competing rights of herders and farmers in transhumant zones. New rural codes must provide flexible frameworks for the implementation of regional or local policies. Failure to remove legislative obstacles to private initiative will raise the cost and lower the success rate of all future natural resources management efforts in the region.

9.6.8 Tenure and land use policy and legal reform has been under study for some time in Mali (see Annex 8). It has also been a topic of substantial research and project experience throughout the Sahel. Traditional systems of tree tenure, grazing land access, crop land ownership and use have been extensively described for Mali. Projects have shown that local modification of the codes can result in increased local investment in tree planting and soil and water conservation. In Mali and elsewhere in the Sahel, movement toward recognition of local control has had similar impact. While reform of the basic laws and implementing institutions may take years, the donor community in general, and AID specifically, should encourage and support initiatives to modify code enforcement which will permit the Malian government to accumulate more widespread experience with local resource management.

9.7 Training and Extension Delivery Strategies

One of the findings of the SSRA is the need to reverse the emphasis of donor-financed training activities. Those who directly manage resources would be the principal targets for training. The order of priority would be:

- o farmers, herders and fishermen i.e., those people who, in fact, manage Mali's natural resources;
- o extension and forest personnel who extend technologies and enforce existing legislation;
- o the mid- and upper-level staff who direct and manage institutions and projects.

This ranking would support the training, information and extension program of the PNLCD. As the success of training programs in the near- to medium-term is highly dependent on the performance environment in which trainees work, the programs on farmer and field service agent training should be concentrated in areas where projects or other special programs permit training to be put to effective use.

9.7.1 Techniques

NRM training can be based upon a combination of techniques including model sites, user-driven training modules and extension and visit methods. All have been used successfully in Mali.

The Model Sites Method

Successful extension activities identified in the SSRA frequently involved this technique. There is no better extension worker than the farmer/herder who has participated in a successful activity. In the OHV zone, farmer-to-farmer extension and the use of model farmers provide local examples of this technique (SSRA Case: SWMU, CARE Majji, CARE Koro).

The model sites technique involves taking potential participants from one target area to a model site. Participants include both extension agents and potential beneficiaries. Local consultants (i.e., farmers and extension personnel) explain the intervention to the visitors at the site. Upon returning to their home area, site visit participants undertake the initiative themselves. OHV has recently begun to use this method which it calls "contact farmers".

User-Driven Extension Techniques

Successful extension activities identified in the SSRA frequently involved use of this technique. In a number of cases, this method was adopted by extension agents in the aftermath of less successful top-down extension.

The user-driven approach entails local training in packaged extension modules. The modules are developed from needs expressed by the population to extension personnel. Unlike the model sites approach, trainers and training are brought to participants by extension personnel. Key elements of this approach include: iterative identification of extension needs; creation of voluntary participant groups (minimum 15 per theme); identification of local group leader/contact; elaboration of input needs by participating group; modification of the extension module; training of trainers; regular extension visits over the course of the activity; monitoring and follow-up; group evaluation of the extension exercise (for example, the OHV Project).

Classical Training and Visit Method

Classical extension and visit techniques may be used for certain management activities. This approach, like the former, should be goal-driven but may entail fewer novel technical elements (for example, CMDT cotton cultivation techniques and fertilizer use).

9.7.2 Identifying Intervention Sites and Beneficiaries

Initial sites should be chosen with an eye to establishing a good reputation for a program of strategic natural resources management interventions. One of the fundamental criterion for site selection must be identification of specific resources. Appropriate characteristics of these resources include:

- o major economic importance to producers;
- o significant user concern over potential or actual degradation of resources;
- o available, low-cost, technical interventions to reverse degradation;

- o minimally-controversial traditional ownership or use rights;
- o nascent policy and institutions able to support increased user authority over the relevant resources.

No less important in selecting eligible communities is evidence of existing, popular, local organizations active in some field of endeavour.

9.8 Financial Support

For any strategy to have sustainability, it must provide sufficient short- and long-term incentives. These incentives usually take the form of sufficient monetary return to satisfy felt needs. Investments which offer no return to the farmer, no matter how environmentally-sound, have little prospect of being widely adopted.

There is a range of technically- and environmentally-sound interventions which are also financially viable as was shown in the SSRA. The strategies use grants to create or strengthen extension services to train farmers in technical interventions and cooperatives in organization, marketing and management of their returns. Loans are made to cooperatives to finance in-field activities which allow increased short- and long-term returns. These returns then provide incentives to both individual farmers and the co-op to participate and cooperate.

There are three phases to sustainable development that must be considered in financing. These are the R&D phase, the short-term phase and the long-term phase.

9.8.1 R&D

The R&D phase is where techniques are developed and modified until they can produce sustainable results. Many development projects get stuck in this phase or are terminated as unsuccessful before techniques and delivery systems mature. Financial requirements are heavy because of infrastructure, technical assistance and research requirements. Returns are usually non-existent.

The first generation SSRA techniques for crop and land use have already been tested in local settings. By attaching strategic interventions to ongoing programs and projects, the R&D phase is largely bypassed.

9.8.2 The Short-Term

In the short run, techniques are applied and short-term benefits occur. Sustainability may be achieved in this phase only if the natural resources base is sufficiently stabilized through short-term actions. Financial requirements are moderate to heavy with the money going to field actions and extension of proven technologies. Investments in technologies that have a pay-back in the long-term are made during the short-term phase. Returns begin to occur that provide immediate incentives. Both external (donor) and internal (co-op) sources of financing are mobilized, with internal sources taking over an increasing share of the financing required for strategic action.

9.8.3 The Long-Term

Long-term benefits occur. The natural resources base is stabilized and improved enough to allow sustained development. Investments are needed only for the maintenance of the production system. Long-term returns on investments are beginning to be realized. The financing source becomes entirely internal and sufficient capital is generated for use in a broadened array of activities.

ANNEX 10
CONTACTS

Ministry of Environment and Animal Husbandry

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Mr. Nampaa Sanogho, Directeur General des Eaux et Forets
Mr. Salifou Kanoute, Directeur Adjoint, DNEF
Mr. Souleymane Diarre, Direction Nationale des Eaux et Forets (DNEF)
Mr. Ousmane Sangare, DNEF
Mr. Yacoub Berthe, DNEF
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Mr. Karim Kamara, Formation
Mr. Issa Diere, Vulgarisation

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Mr. Youssuf Cisse
Mr. Samba Traore
Mr. Fofana

Private Voluntary/Non-Governmental Organizations Contacted

CCA-ONG (Ministry of Plan-Sponsored ONG Coordinating Council)
Three group meetings were held with the NGO's that were members of CCA-ONG. The following list mentions those organizations contacted individually.

AIDGUM
Africare
Care-Mali
Catholic Relief Services
Euroned
Freedom From Hunger
International Union for the Conservation of Nature
Save the Children-USA
Save the Children-UK

Multilateral and Non-US Bilateral Donor Agencies Contacted

Canadian International Development Agency
French - Caisse Centrale de Cooperation Economique
Dutch Aid
Swiss Aid
German Technical Assistance -GTZ
African Development Bank
IBRD/IDA
United Nations Sahelian Office

ANNEX 11
SELECTED REFERENCES

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